

LIBRARIES AND IT

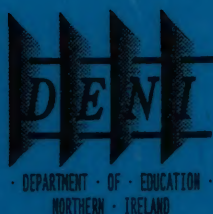
Working papers of the
Information Technology
Sub-committee of the HEFCs'
Libraries Review



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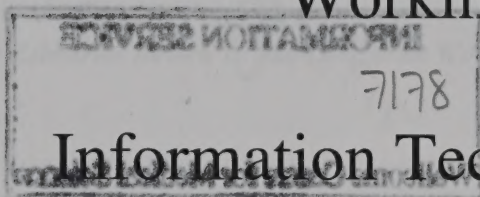
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Bath

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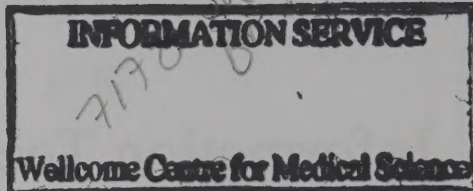
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Preface

Publishing HEFCs' Libraries Review IT Sub-committee Working Papers

Lynne Brindley

Chair, IT Sub-committee of the HEFCs' Libraries Review

Introduction

The decision of the Higher Education Funding Councils of England, Scotland and Wales, and the Department of Education for Northern Ireland, to set up a Review of library provision in the Autumn of 1992 was welcomed as a recognition of the central role that libraries play in the educational experience of university students and the importance of library research resources and information services to underpin quality research and scholarship, across the recently unified higher education sector. The setting up of the Review, chaired by Sir Brian Follett, was guided by a range of issues, of concern to universities and to the Funding Councils, which had begun to emerge in the context of a rapidly expanding sector, putting pressure on space and accommodation, as well as highlighting uneven library provision across institutions, and opportunities for resource sharing. The difficulties in sustaining journal collections, in the light of continuing increases in prices, and the gradual decline in academic library spending in relation to total university income were other driving forces, well known in their practical consequences to all university librarians. Further major factors included the recognition of the importance of technological change for library services: a continuing search for technological improvement has been and will continue to be important for the shape of services, for the provision of access to a wide range of information resources, for resource sharing across the sector and more widely, and for the stimulation of new forms of technology-based learning.

In order to complete its work in a relatively short timescale the Review was structured into three Sub-committees, under the umbrella of the main Review Committee chaired by Sir Brian Follett. The responsibilities of these Sub-committees were respectively: funding and resources; the management of libraries; and, for this Sub-committee, information technology (IT). There was, of course, a recognition that these topics significantly overlapped and that inter-related discussion was

necessary. This was largely achieved through overlapping membership and discussion at the meetings of the main Review Committee. The members of the IT Sub-committee were as follows: Ms Lynne Brindley (London School of Economics), Mr Bahram Bekhradnia (HEFCE), Mr Michael Breaks (Heriot-Watt University), Mr Nich J. Butler (Oxford Brookes University), Sir Roger Elliott (Oxford University Press), Professor Sir Brian Follett (University of Warwick), Mr Nigel Gardner (University of Ulster), Dr Richard Heseltine (University of Hull), Mr Derek Law (King's College London), Mr Rene Olivieri (Blackwell Publishers), Mr David Russon (British Library), Mr Michael Sibly (HEFCE), Mr Alan Singleton (Institute of Physics Publishing Ltd), and Mr Ian R. Winkworth (University of Northumbria at Newcastle).

The IT Sub-committee was given a brief to support the teaching and research-related objectives of the Review, and focused particularly on how developments in IT might be harnessed to underpin change across the whole academic library sector. The IT Sub-committee was not primarily concerned with the future of the technology *per se*: nor did it choose to spend much time speculating about the vision of the library of the future. The Review started out pragmatically: the IT Sub-committee worked within that spirit, asking what problems IT might assist in solving, what initiatives might be encouraged, and what action might be taken over the next three to five years to facilitate useful developments of benefit to library users in higher education, pushing boundaries forward in a nationally cost effective way. The Group constantly reminded itself that technology should be subservient to user needs and solving problems, and that long-term visions of electronic, or even virtual libraries, while stimulating, were uncertain and even suspect. Instead the Sub-committee sought limited, plausible paths of development to take libraries in UK higher education forward into this future. Our agenda was deliberately partial and limited: with expert advice we hope to have identified at least some of the key areas: equally importantly, if we felt that IT could not significantly contribute to solving a problem in the medium term, this was identified, to avoid any suggestion that IT could offer a panacea for all problems.

Our method of working was soon established: the Sub-committee sought for most of its meetings a range of working papers and contributions from individual experts on particular topics of interest, or assessments of developments in particular areas of concern. The members of the Sub-committee found this diversity of contributions a huge stimulus to the debate, and in many cases papers filled in gaps in our own knowledge, whatever our background. Some contributions were deliberately commissioned, with clear terms of reference; other contributions were requested, often from people very busy with other jobs, in the hope that we could exploit their expertise and share their views of what was important; still others were volunteered, in the spirit of wishing to contribute positively to the Review. The contributions are therefore very mixed in length, topics and styles: what they have in common is the generosity of time and intellectual involvement given by each contributor. Thanks go to all of them for the significant role they played in stimulating discussion and developing thinking within the Sub-committee.

After several months of working, as the set of Working Papers began to cumulate, the Sub-committee realised the inherent value of the papers and their potential interest to a much wider audience of librarians, academics, technologists, publishers, and others in the information industry. It was agreed that we should seek to make available the working papers, as quickly as possible, to a wide audience: this volume is the result. Please approach them in the spirit in which they were

contributed: they were working papers, often produced in the haste of the committee timetable, with inevitably some errors of fact, and even containing already some superseded information. They are presented in the order the IT Sub-committee considered them - sometimes this was logical, at other times it was contingent on when individuals could find time to contribute, and in other cases, when gaps in knowledge became apparent.

Nevertheless, with the professional assistance of UKOLN, and in particular of Lorcan Dempsey, who enthusiastically took on the preparation and publishing task, we hope that these papers will be a timely contribution to further the knowledge of a wider community. They appear here well in advance of the final report of the Follett Libraries Review - to have delayed publication would have limited their usefulness as an awareness and updating tool about relevant developments. The generous support of Rank Xerox who in the spirit of pragmatism used their DocuTech technology to print the final copies of these Working Papers, is gratefully acknowledged.

As Chairman of the IT Sub-committee I hope that these working papers will provide some new insights into your understanding of what the future might hold. Whether you approach the evolution of library services with excitement or with unease, an appreciation of information technology-based developments is fundamental to a full professional contribution.

Thanks must finally and most importantly go to my fellow Committee members who took up the challenge of the Review, who have shaped the contribution of the IT Sub-committee report and our recommendations, as a substantial input to the full Review, and to both David Cook and Alice Colban, who provided efficient and energetic secretariat support to the Committee, making our work both easier and more enjoyable.

(15 August 1993)

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Policy for JISC dataset services provision

Joint Information Systems Committee

1. In fulfilling its terms of reference and in seeking to respond to community needs, the JISC will be a major funding agency alongside Research Councils, Government Departments and Professional Institutions and Societies and the sites themselves through libraries.
2. Both ESRC and NERC have had discussion papers prepared and their policies on dataset provision are emerging. It is appropriate for the JISC to adopt a policy on dataset provision and services. The PURPOSE of this paper is to establish the JISC policy framework for its participation in the provision of vital information datasets and associated services to the wider education and research community.
3. The SCOPE of the policy is intended to cover needs of all higher education and research institutions.
4. The paper rehearses some of the background leading to its production and then addresses in more detail:

- Characteristics of Datasets
- Acquisition and transformation of datasets
- Models for provision of service
- User access, information and support services
- Service agreements
- Archive Services
- Charging approaches
- Administration, management and control
- Coordination with other bodies
- Recommendations

Background

5. The need for a clearly articulated JISC policy on dataset acquisition and service provision has been demonstrated in recent years in a number of ways:

- a. through the JISC piloting use of online bibliographic services through the Bath-based ISI service and its decision to collocate EMBASE there for a 6 month period;
- b. through the joint ESRC/JISC national Census support activities being built at Manchester;
- c. through the JISC funded national dataset service at MCC demonstrating the value of providing on-line access and associated specialist support services for a number of large datasets, such as the continuous government surveys;
- d. through growing demands for archive services and long term storage and protection of valuable dataset assets;
- e. through the growing demands for access to datasets in the Sciences, Social Sciences, Arts and Humanities, in terms of both quantitative economic, finance and accountancy data and for full, free-text and multi-lingual databases, corpora and concordances.

6. As the Higher Education system expands through the 1990s, increasing pressures on resources will reinforce this need to achieve economies of scale in provision of costly information services, particularly access by individuals and institutions to expensive external databases and datasets.

7. In common with the JISC, at least two of the research councils are in the process of formulating and adopting policies in this area. It is therefore appropriate that the JISC articulates its own policy and facilitates complementary development to reflect its national role in the provision of common good services. This will help to ensure that the community as a whole obtains efficient and effective datasets and research information services.

Characteristics of datasets

8. It is possible to characterise datasets in a variety of ways, which relate significantly to their field of application and preferred mode of delivery.

9. The term 'research data' covers a huge range from population censuses to astronomical radio signals. They are used in many institutions not only for research purposes but often also, possibly in reduced form, for teaching. Research data may in some cases attract funding and support from Research Councils and professional bodies. Bibliographic datasets are likely to be appropriate for JISC investment (as a service) or for funding via libraries; librarians are likely to be a major source of advice. There is also increasing interest in holding in machine

readable form the texts of literary and reference works currently held in paper form in libraries; again librarians should be a major source of advice.

10. Many current datasets are character based. Librarians are showing interest in making images available. The transfer of images via Janet is feasible, although delivery of moving images over the network will require SuperJANET capacities.

11. The volatility or currency of a dataset is another important characteristic. At one end of the spectrum are the entirely fixed datasets such as results of surveys and censuses. This includes archival datasets. At the other end are constantly changing datasets such as financial data and research data in rapidly expanding areas such as DNA reference sets which grow daily. Volatility may affect the choices of technology for delivering a dataset since, for example, static datasets can be pressed onto read only media at low cost. It is however important to distinguish the means of distribution and the means of delivering service.

12. Size and complexity are clearly major parameters. Size is a relative factor as the cost of holding datasets is dropping, and hence the concept of a 'large' dataset is changing. However, small datasets can have high support costs because of complexity; and so sometimes small datasets are still best kept centrally rather than replicating support costs.

13. Completeness and fitness for purpose are major considerations. Often datasets as available are unsuited to use in higher education, or further work is needed to exploit them properly. For example it may be necessary to aggregate or disaggregate data, to change format or to rearrange data. Thus acquisition and support costs need to take account of these factors.

14. Similarly, many datasets may need specific access software to make them usable. Care must always be taken to include such software in specifications, both with regard to costs and to availability on the necessary platforms.

15. Other factors include confidentiality, licensing restrictions, ease of archiving, and the availability of software to make effective use of the data and its cost.

16. Accordingly, rather than attempt a taxonomy for funding purposes, it is best to continue to treat dataset provision on a case by case basis.

Dataset acquisition

17. Dataset provision is a complex activity which includes: identification of needs; assessing likely take-up and costing options for acquiring the data and providing services; life-cycle cost justification; and selection of best funding mechanism, method and cost of provision, maintenance, documentation, support and training. Much of this must be negotiated with potential suppliers.

18. The policy approach recommended is for JISC through ISSC to establish and maintain a PORTFOLIO of datasets which seeks to cover all disciplines in which the community has an interest.

19. To ensure best value for money in the context of overall funding, an inter-agency group of all funding bodies should be established to negotiate priorities and resource contributions. This inter-agency group will provide an important input contribution to the review and revision of JISC policy on acquisition and provision. The software and datasets godfather should be one JISC representative on this group.

20. In pursuing value for money, a pre-requisite to the acquisition of datasets from within this portfolio, using JISC funds wholly or in part, will be a full life-cycle cost justification of any purchase or licensing agreement. Agreement will be required on the appropriate apportionment of capital and recurrent costs amongst funding bodies and sites.

21. The complicated nature of datasets and services, together with the involvement of other agencies, can make negotiations complex; as can factors such as the appropriateness of the dataset in its current form for the purpose required, and special licensing conditions. To achieve the optimal package for a service it will be necessary for specific teams to be formed to conduct negotiations (as with the census data).

Models for provision

22. Having justified the acquisition of a particular dataset it will be necessary to select the most cost effective technical option for delivery and support of services, taking into account the factors in paras 8-16.

23. Media for service provision may include CD-ROM, floppy disc, as well as more traditional media such as magnetic tape, microfilm or paper. In addition online services may be provided from within or without the community. Combinations of any of these are likely.

24. The most appropriate choice of technical options will vary: for example, at the moment, high use, volatile datasets will probably be appropriate for a datacentre providing online access; whereas, for high use, static data, locally networked CD-ROM might be the appropriate delivery mechanism. JISC, alongside any funding partners, will need to decide on a case by case basis.

25. JISC funding will include normally only capital for acquisition and transformation of the dataset, and provision of essential hardware and software delivery platforms.

26. Funding for provision of services, support and for incremental hardware upgrades and replacement will normally be expected to come in conjunction with other funding agencies, or through subscription paid by user sites. The ISI service model has shown that this is a viable approach, although for limited use and specialised datasets an alternative funding approach might be necessary. JISC funding will not be available unless long term support for a service is guaranteed.

Service agreements

27. Any decision by JISC to place a dataset service or support contract to a particular site will require a service agreement based on service definitions.
28. The service agreement will include a requirement for the host site to provide or commission appropriate, professional quality, documentation and training material.
29. Subject to the licensing agreement for provision of services using a particular dataset, the host datacentre would be free to exploit opportunities to market value added services based on its experience in providing the service to academic users. JISC would expect a proportion of any surplus revenue from such exploitation to be reinvested in developing the services to academic users.
30. JISC will make appropriate provision within its structure to ensure that service definitions are met.
31. Service agreements will be monitored on advice from the community and ISSC, in terms of quality and agreed performance indicators. Such indicators will include assessments of levels of use and user satisfaction. They will take into account costs of service against value added to the academic community; and some assessment of the impact of the service on teaching and research. It is likely that each major service will have its own steering and/or user group which will provide useful information.

User access and support services

32. CHEST currently issue a broad code of conduct on the issue of software and datasets but for major datasets it is proposed that the conditions of use should be case specific.
33. Catalogues and awareness information will need to be prepared and made available for the whole system through national Bulletin Board services. This requirement should form part of the service definitions.
34. JISC will expect that access to any national dataset service will be available to any HE user authorised by his/her local service, and will normally be free for academic use, at the point of access.
35. First line support for users will be the responsibility of end user sites. Datacentres will be required, as part of agreed service definitions and contracts, to provide professional quality support and related training material.

Charging policies

36. Policy on recurrent charging, for JISC-provided datasets, is that charges would normally be met by non-JISC funding. One model, where no other funding agency is involved, is for costs to be levied in the form of institutional subscriptions, to ensure a fully staffed support

service, and provide for upgrade and replacement of hardware platforms, thereby making the service self-sustaining.

37. Current practice in software provision is to levy charges, normally, at a flat rate, irrespective of size of institution involved. This approach may have to be varied for some datasets. Alternative charging policies might specifically be necessary for some research datasets. To date the evidence is unclear; usage of ISI, for instance, does not correlate with institution size. Simplicity is an important characteristic of any successful charging method.

38. Non academic use may be subject to specific charges to be agreed on a case by case basis. Special consultancy charges may be levied.

Archive services

39. In order to protect the investment in datasets, and to ensure that they are available for the study of change and for historical re-validation, it is essential that they are archived. The threats which currently act against data re-use are:

- a. physical technological change;
- b. software change; and
- c. lack of provision for the retention of accompanying documentation.

40. Data archives build a technological shell around their holdings to ensure that change can be accommodated by single revision sweeps through the holdings. At the time of acquisition of a dataset, provision must be made for immediate archiving, unless it be decided that the data are of transient interest only. Sets of data for archiving should be identified at this early stage, not only for security reasons but also because the format of the initial data can affect the resources required for archiving.

41. Archives may also be datacentres designated to carry out the initial dissemination, but this is not essential. Of greater importance is that an archive has relevant expertise and facilities, including hardware which is based on a number of different physical devices, for security; and archival, certification and conversion software. Archiving data has cost implications which must be considered alongside the costs of support and dissemination. Provision for archiving thus needs to be made at the time of acquisition.

Administration and management

42. Major datacentres would be expected to support online datasets leading to a peak load of at least 150 simultaneously active users, probably with at least 5 datasets. We would expect datacentres to develop distinctive skills and expertise. The need for competition and diversity points to a requirement for a number (say five) datacentres. The JISC will require systems for control and review. Such review will be aimed at ensuring continued quality of service and cost effectiveness.

43. Agreements or contracts between JISC and service providers will normally be for three years, with annual rolls-forward, or notice to close down in two years. In the event of a decision to close a service, provision must be made during the wind-down period for disposal, archive or transfer of related datasets.
44. Assignment of suitable datasets to one or more datacentres will normally be as a result of a bidding process. Opportunities need to be provided for new sites to be eligible to bid for new datasets, or to take over existing services from other datacentres. Criteria used for selection will include price, track record and services offered.
45. JISC will consult and collaborate with other funding bodies in the establishment or closure of national dataset services.

Recommendations

46. That JISC adopt the policy laid out in this document for dataset acquisition.
47. That the JISC, in substantiating its intention to be a major funding agency alongside Research Councils, Government Departments, Professional Institutions and Societies and the sites themselves, and in order to fulfil its terms of reference in response to community needs, confirm an initial budget of at least £1 Million a year for routine dataset activities, excluding hardware and census data costs, and other large one-off costs.
48. That a major area for JISC involvement will be the establishment of a small number of datacentres to hold datasets funded by JISC and others, meeting appropriate quality conditions assured by service definitions laid down through ISSC.
49. That JISC maintain a three year plan and programme for its expenditure on datasets. ISSC will establish such a programme by liaising with other funding bodies, and by the establishment of an inter-agency group to advise and monitor the acquisition and assignment of datasets to datacentres and assuring that appropriate provision is made for support, archiving and marketing and other information services.
50. That JISC will take the initiative in bringing together such an inter-agency group.
51. That a letter be issued seeking sites interested in becoming potential datacentres, and inviting them to identify those services and dataset areas in which they have expertise. The result could provide a basis for subsequent invitations for competitive bids from sites for specific datasets. We expect this exercise to provide a short-list of between five and ten candidates.
52. That JISC encourage the commissioning, assembly and dissemination of catalogue and awareness information about available datasets and means of access, through existing services.

Electronic signatures: interlibrary loans, networking and copyright law

Frances Krivine
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Libraries and information services are increasingly offering access to networked electronic information sources and services, encouraged by national pressures for resource sharing. Access to other libraries' catalogues and collections is often taking the place of direct provision of documents held locally/on-site. Customer awareness has been raised and expectations are that all services should be accessible over campus networks. These expectations cannot be fulfilled when the service in question falls foul of the Copyright, Designs and Patents Act 1988. This paper proposes that high-level representations be made for a change in the law, with respect to the copyright declaration for inter-library loan requests which would allow remote input of such requests from the academics' own terminal or PC and legitimise the use of 'electronic signatures' between users and direct suppliers.

At the moment the majority of requests for inter-library loans are delivered as photocopies of journal articles by either Fax or Post. Every request requires a signed declaration as to the purposes of the request. The schedule which is part of the Copyright Regulations 1989 (S.I. no. 1212, Schedule 2, Form A) clearly states that the signature must be the personal signature of the person making the request. A stamped or typewritten signature ... is NOT (*sic*) acceptable. The effect of this requirement is that requests must be made on a special form hand-signed and delivered (either personally or by post) to the Library which is processing the request. It is not possible to make an online request, either directly or through the networked library system, without breaking copyright law, even though an ID and PIN is necessary, and the declaration required thus has an electronic signature.

As speedy, full text document delivery over the networks to the user's desktop approaches, and users have direct access to information over the network, it is even more anachronistic that the user is required to actually come into the library to make the original request, inevitably slowing down the process. If the library is handling the request it has to be keyed into the interlibrary loans system by staff, to take advantage of electronic transmission to the current major supplier of loans, the British Library Document Supply Centre. Users wishing direct

request facilities without the need to use the library as intermediary will also have the same problem.

Various ways to 'get round' the copyright declaration have been suggested (*Appendix 1*). These must be viewed against the resource implications for thousands of potential direct borrowers or for libraries handling an average of 10,000 requests per year (with larger institutions moving towards 20,000) and are not operationally viable.

The solution is a change in the law to allow the acceptance of electronic signatures and electronic storage of these, or to abandon completely the requirement for a declaration. This would enable requests to be made online, often within the online catalogue, for forward submission to the supplier after a simple validation procedure i.e. to be held only in electronic format.

This problem is only one example which has great implications for the future of library access policies and decentralised networked resource sharing. The legality of electronic copies, held in storage very temporarily before transmission, is also in question, as this can be interpreted to constitute multiple copying, again not allowed under the Copyright Act. The Libraries Review is requested to consider ways in which this matter can be raised and actioned through appropriate channels.

N.B. This issue has already been raised with the LA/Joint Consultative Committee¹ and the Standing Conference of National and University Libraries (SCONUL) is being kept informed. The Joint Committee has approached the Patent Office.

Appendix 1

Solutions which are not deemed operationally practicable

- (1) Using Copyright Cleared - a service negotiated with publishers and provided by BLDSC, which removes the legal restrictions in return for an additional payment of approximately £1 per item.
There are thousands of potential borrowers and lenders. Providing this BLDSC facility does not address the principles at stake in building a decentralised network service. For libraries, blanket use of Copyright Cleared would immediately add £10,000 - £20,000 to the average library's already heavy bill for ILLs (each loan currently costs £4).
- (2) Asking users to print their online requests and post these to the library bearing a hand-written signature. This implies the checking (and holding) of every online request until a matching piece of paper arrives. An operational nightmare with huge resource implications and no gain in speeding the request.

¹ Aslib, Council of Polytechnic Librarians, Institution of Information Scientists, Library Association, SCONUL and the Society of Archivists

- (3) A blanket declaration signed by the user at the beginning of the academic year, to the effect that all electronic signatures are covered. This is extremely dubious legally.
- (4) Asking users to come and collect photocopies and sign for them at that stage – currently all photocopies are posted to users. A further administrative load and a deterioration in speed of supply.

Electrocopying: problems and needs

Graham P Cornish
British Library

Electrocopying (a loose term for a range of activities which involves copying text and graphics into an electronic format, regardless of the original format used for presentation) creates many threats and opportunities for both owners and users. The basic threats as seen by owners are inability to control distribution, loss of revenue and integrity of the material, although there are other anxieties as well. For users the major threat is lack of access, high charges and lack of choice. The opportunities are found where flexibility of format, access and charging can be combined.

Threats as perceived by owners

Loss of control

Publishers have traditionally controlled the distribution of their works through agency agreements and other contracts. It has proved virtually impossible to prevent photocopying and conversion into electronic formats is equally difficult to prevent as the same basic techniques are used. Once a work has been made available in electronic form control is just as difficult to achieve because material can be transmitted across borders (for example) in seconds. Coupled with control is the need to know about the use to which works are put (libraries, private individuals, industry or academia, *etc.*). Although this data can be collected from electronic formats more easily than from sales of printed material the ease of access which electronic formats provide mean that the uses to which material is put become more complex and therefore more difficult to monitor.

Loss of revenue

Naturally publishers wish to continue to make money from the products but it is very difficult to control the use of a work in electronic form. Copying is easy and further copying just as easy with no loss of quality. Now that licensing schemes are available for copying onto paper publishers see this as a major threat because of the 'licence to copy' attitude which is becoming prevalent. A licence to copy in one format is often seen as a licence to copy into *any* format despite the fact that the two types of action are treated quite separately by the owners.

Electrocopying potentially deprives them of considerable added revenue. With the introduction of high quality electronic networks it will become possible to network texts, whether copied or supplied in electronic form, and this will enable one server to provide copies to many customers, thus reducing subscriptions to publishers' materials.

Integrity of the text

Despite the fact that most electrocopying is carried out in facsimile mode so that the text cannot be manipulated publishers still fear that it will be possible to download, edit, manipulate, merge and redistribute their materials without either their knowledge or permission or allowing them to receive any compensation.

Threats perceived by users

The major threat seen by users is that the publishers will not permit copying into electronic formats. This would severely inhibit the development of new services in libraries and the use of computer technology of readers (end-users) for storing and consulting text. The other threat seen by users is that permission will eventually be given for this type of copying but the charges set will be so high they are prohibitive. As publishers have absolute rights over this type of permission a virtual monopoly situation is established to the detriment of the user.

Opportunities seen by owners

Wider distribution

Publishers cannot reach all the markets they wish so that permission to copy material into electronic format may open up new markets in the information industry which have been untapped until now. In this sense libraries and information intermediaries can act as agents for publishers, distributing the work where it could not go before.

Increased revenue

Because electrocopying cannot be undertaken without permission, the publisher is free to make a charge for this type of copying, revenue which is from a quite new source. Use of the material in electronic form can also be monitored and used to generate further revenue where appropriate.

Marketing capabilities

Publishers need to know about the use of their products and storage in electronic form could provide them with additional information on the detailed use of their products. Furthermore this information could be detailed to give data on segments of a product not just the product as a whole.

Opportunities seen by users

Improved access

Users see electrocopying as one way to improve access to materials. Networking will permit more libraries and users to gain direct access to electronic texts and this access can also be segmented to allow access to discrete elements rather than a whole work. Furthermore storing material in electronic form can make searching and identification of specific elements easier. Access also depends on speed and electrocopying can permit rapid access within seconds rather than the slow and unreliable transmission of paper copies.

Better quality

Electrocopying produces surrogate copies indistinguishable from the original so that the vagaries of photocopying and fax transmission are avoided.

Diversity of services and products

Information intermediaries see the opportunity to offer a much wider range of services in the areas of selective dissemination of information (SDI) services, contents pages and current awareness bulletins.

Control

The most important element in this area is control. Generally publishers do not wish to prohibit access but rather to control it to ensure adequate payments. The major concern from both owners and users is that no proper mechanism can be identified and that electrocopying will therefore not be permitted at all. There are only two real possibilities:

1. *either* set up a collecting agency or agencies which would grant permissions in return for fees which would be passed to the owners
2. *or* obtain permission from each publisher separately.

The owners do not like the first option because it takes away their individual control and there is a general feeling that such agencies do not represent value for money. Users would much prefer to be able to deal with one single agency or possibly two or three.

The way that rights owners are currently thinking can be judged from a recent 'model' licence for electrocopying which has been issued by the Scientific, Technical & Medical Publishers Group (STM) an influential group representing most major publishers in this field. A copy of the model is attached to this note.

Users want to avoid having to approach each owners individually as this will be costly in time and effort, probably result in a range of different agreements and permissions at different levels

of charges and also result in some publishers either refusing permission or, worse, not replying at all.

(1 December 1992)

A list of Information Technology projects within the British Library

David White
British Library

IT Strategy within the British Library

The strategic development of the British Library will depend critically on the application of information technology. As well as the support of the ongoing operations within the Library, of cataloguing, collection management, request processing, and delivery systems, there are several key areas where further development is planned.

1. Automation of reading room services at the new building at St. Pancras.
2. Development of Network Services which will provide remote and reading room access to the full range of Library catalogues, requesting and reservation services, delivery of an increasing range of items in digitised format, and at a later date to catalogues and indexes from outside the Library.
3. Development of service driven policies and programmes for collection and preservation of digital material and digitisation of non-digital material.

Other important developments include expansion of corporate interoperability and integration of systems, in order to maximise effectiveness of services and efficiency of internal operations, and to increase their hospitality to change; automated support for a unified collection; introduction of comprehensive corporate electronic mail for internal and external use; and introduction of an effective management information system, linked to improved financial and personnel systems.

Name	Automated Book Retrieval System (ABRS92)
Description	St Pancras project to allow user to order book from the OPAC system to be brought to reader's desk.
Name	Mechanical Book Handling System (MBHS)
Description	St Pancras project using horizontal conveyors and vertical elevators to transport items from basement stores to correct locations in the staff areas and reading rooms.

Name	Reader Admissions System (RAS)
Description	St Pancras project to provide regulated access to the Library for different types of staff and user.
Name	OPAC93
Description	Project to make available the Library's OPAC on JANET by June 1993. OPAC presently provides access to 15 million records from the BLC, SCICAT, Music, and H&SS catalogues.
Name	Networking Focus
Description	A CEO project to investigate the provision of a national and international networked information service from the BL. Considerations include bibliographic record supply via file transfer, electronic document delivery, multimedia services and transmission of requests by e-mail.
Name	St. Pancras Front Hall Information System
Description	A non-interactive automated information system for visitors, readers and staff. Information to include: daily and forthcoming events, opening hours, emergency or special messages.
Name	NSA IT Project
Description	Develop automated cataloguing system for National Sound Archive; contract with Touche Ross Management Consultants. 900,000 discs, 70,000 hours of tape, 6,000 videos. Access from St. Pancras to tie in with planned listening service from there.
Name	Catalogue of Printed Music (CPM)
Description	Special Collections collaboration with Bowker Saur to convert printed CPM for OPAC access & replace current cataloguing of scores. A CD-ROM will be published.
Name	European Printed Books Catalogue Conversion
Description	Special Collections project to convert 150,000 catalogue records from card files into machine-readable format and made available on OPAC.
Name	Cartographic Materials Retrospective Conversion
Description	A Special Collections collaboration with Research Publications International to convert the Map Library Catalogue, consisting of both manuscript and printed maps, to be available on OPAC. Expected 300,000 items, with access points: title, scale, Dewey area, geographic heading, subject division. A CD-ROM will be published.
Name	MSS Current Cataloguing
Description	Pre-1956 catalogue records are to be converted to machine-readable format and added to existing Manuscripts Automated System, already containing post-1956 records.

Name	17C German Catalogue Conversion
Description	Conversion of card catalogue into machine-readable format in order to publish a printed version. A later project could be the provision of access via the OPAC
Name	Patent Express Automation
Description	To provide the SRIS Patent Express document supply service with a system for the storage and retrieval of images of patent specifications on CD-ROM, and for the automatic delivery of documents by fax.
Name	Serials Control Project
Description	The future development for AP&C and DSC serials acquisitions, cataloguing and circulation system.
Name	BL Common Stock Current Serials Database
Description	Development of a library-wide database of currently received serials on the Ingres database. It will initially provide access for online searching of titles.
Name	MARS replacement
Description	Replacement of DSC's Geac Monographs Acquisitions and Cataloguing system. New system to handle OIOC and Western European catalogues. Evaluation of tenders will take place in Dec. 1992.
Name	ARTTel 2
Description	To provide more user-friendly interface for receipt of requests to DSC via various online links. Adaptation of DSC's Automated Request Transmission (ART) system to accommodate requests for SRIS's patents service.
Name	Automated Debiting
Description	Allows DSC unit accounts to be debited at the same time as recording despatch information.
Name	OCLC Request Automation
Description	DSC project to automate the processing of requests coming directly from OCLC users.
Name	AUTOMATCH
Description	Sorts DSC ART serial requests by means of matching serial title to location in stores. Latest modification will include ADONIS locations.
Name	ADONIS
Description	DSC project which stores medical journals on CD-ROMs. Requests are satisfied by printing from this rather than being photocopied from a document.

Name	Electronic Full Text Database
Description	DSC experimental project to store full text articles as electronic files.
Name	Electronic Document Delivery
Description	DSC experimental project to transfer documents scanned into electronic files via networks to certain universities.
Name	Unit Accounting System
Description	Present Unit Accounting permits DSC overseas customers, instead of purchasing and sending request forms, to purchase units credited to an account, which is later debited when items are loaned/photocopied. Project is underway to study requirements for UK customers to have similar service.
Name	C&T MIS Development Project
Description	Provision of MIS for C&T directorate by Comshare's System W.
Name	Multimedia Research and Discovery Centre
Description	Provide access for research, education and leisure, to primary source material stored in electronic format. Range will include print, manuscripts, sound archives, and other audio-visual material. (Confidential)
Name	Newspaper Library Retrospective Conversion
Description	Project to convert card catalogue of Newspaper Library's holdings into machine-readable format and provide access on the OPAC.
Name	Automation of Records of Archival Photographic Negatives
Description	Provide public access to the several hundred thousand slides, transparencies and black-and-white negatives, held in departments (principally Printed Books, Manuscripts, Music, Maps and OIOC).
Name	Automation of Binding Instructions
Description	Feasibility study on suitability of inputting preservation information onto MARC records, and/or BLC files.
Name	Collection Management System
Description	Aims to create a comprehensive storage planning system to record, control and model size and growth of London collections.
Name	Automation of Placing & Labelling
Description	H&SS project to automate the procedures of assigning and attaching pressmarks to books.
Name	Image Processing Project
Description	Storage and retrieval of digital images by scanning of the most popular of DSC's journals.

Name	New Reprographic Technologies Project
Description	H&SS pilot project to investigate the potential for storage and retrieval of digital images by scanning of a relatively small collection.

Name	Multimedia CD-ROMs
Description	Publication of interactive multimedia CD-ROMs, 3 for schools: <i>British Birds</i> (Dec.1992); <i>Inventors and Inventions</i> (Mar. 1993); and <i>Sources in History: the Medieval Realm</i> (Autumn 1993); and another <i>Designing with Type</i> , which introduces users to different typographic renditions of certain manuscripts held in the Library.

Name	Bibliography on Biography (BOB)
Description	Project from NBS to produce relatively cheaper CD-ROM product for wider use within educational establishments and public libraries.

Name	Fiction on Fiche
Description	NBS project to produce a microfiche catalogue of fiction items taken from BNB.

(6 January 1993)

IT research supported by the British Library R&D Department

T H Cannon
British Library

Introduction

The BL R&D Department is an agency for change, seeking to assist in the improvement of the UK's library and information services, with an ultimate concern for the users of those services. We aim to help the managers of information services make the most of new opportunities and respond effectively to new demands, so that users have access to the most efficient services possible and are themselves skilled in finding and using information. The funding of external research projects, in research council mode, is the major activity of the Department.

The following paragraphs briefly describe activities in the main IT areas of interest to libraries, but do not attempt to catalogue all the projects in progress.

Information UK 2000

This forward look at the main influences on the information world over the next ten years was published in 1990. It has formed the basis for debate and planning. We plan to produce, on a subscription basis, a series of specialist looks at the future development in specific areas. Suggestions will be welcome.

Networking and communications

Set up at the University of Bath in 1989, to improve awareness, knowledge and use of networks by libraries, the UK Office for Library Networking (UKOLN) set its primary goal as enabling the production of a common or cohesive strategy for the use of networking by the UK library and information community. To this end, it held six workshops on different aspects and for various sectors, which lead to a major conference in Bath in April 1992. Drawing on experience of experts from the UK and overseas, the conference enabled the library community to see the way ahead with greater clarity and set various actions in train. The most recent of

these actions was the seminar for the BL, *Networking and the Academic Community*, held in Bath in December.

Since October 1992, UKOLN has been jointly supported by BL and the ISC, and on 22 January a launch of the reconstituted Centre will take place in London, to which all members of this Committee are invited.

On the standards side, an award has been made for a joint project to UCL and Brunel University to investigate the use of the OSI directory (X.500), and create a demonstrator system for storing and accessing bibliographic information.

Image handling and multimedia

In 1988, the Department made a major commitment to stimulate research on the management of, and retrieval from, image databases (£100,000 per year for three years). The programme has been reviewed by Dr Tony Cawkell, who has evaluated progress to date, identified possible next steps, and assessed related work which might form part of a further programme. While undoubtedly an area which will see rapid development, it needs a firm basis in research, particularly evaluation of approaches to indexing large collections of image data. Meanwhile, some of the projects might provide useful demonstrators for high-speed search and transmission of image data.

Electronic documents

It is becoming increasingly clear, as the Information UK 2000 report emphasised, that users and libraries will need to handle more and more information in digital form. The Department continues to support a large amount of research addressing the problems of acquisition, storage, transmission and use of digitised information.

With the aid of a grant from the Mellon Foundation to investigate technological alternatives to microfilm for preservation, we have supported a study of digitisation and exploitation of printed and microform library materials at CIMTECH, (University of Hertfordshire), an organisation well placed to advise on state of the art Document Image Processing, Optical Character Recognition and Intelligent Character Recognition. An alternative approach has been studied by Essex University, that of direct acquisition of material in digital form from printers. The report identified a number of issues to be considered before embarking on such an activity.

Active use of electronic documents is the object of an investigation, at University College London, of the American Chemical Society's database of publications. It will cover storage, access, display and use of compound documents (text, tables, bit-mapped graphics) stored in international standard format, ODA, over LAN and ISDN.

Another full text project, at Loughborough University Library, is investigating technical, organisational and cost issues in the production, delivery and use, by both libraries and end-users, of an electronic journal, *Modelling and Simulation in Materials Science and*

Engineering, published by the Institute of Physics. The six participant departments have been identified as likely to demonstrate different technical requirements and organisational solutions in offering the journal to users within their organisations.

De Montfort University is developing an electronic library on its Milton Keynes campus. The Department has given funding for a project co-ordinator for two years to study the following major issues: liaison with other electronic library projects; definition of user requirements; system specifications; selection of library materials; copyright agreement and licensing issues; observation and monitoring of user reaction; and comparison with a control group of users at Leicester. Additional resources are being supplied by IBM Ltd, Kodak and a number of publishers.

Hand-held electronic books

Such has been the speed of development in technology that a study of hand-held electronic books undertaken by Tony Feldman for the BNB Research Funding 1990 had to be followed up just 18 months later with a supplementary report. In that period, the Sony Data Discman has emerged and threatens to sweep aside the market for chip-based products, upon which the earlier report had concentrated. Mr Feldman has also surveyed the development of multi-media publications and their likely market.

(January 1993)

Present status of electronic publishing within the UK publishing industry

David Brown
DJB Associates

OVERVIEW

OVERVIEW

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EXECUTIVE SUMMARY

This report describes the present electronic publishing (EP) activity within the UK academic publishing community. It is divided into four sections. The first analyses the structural and commercial issues which effect the ability to undertake EP by traditional print-on-paper publishers. The second looks at the main systems and technologies which are involved. The third describes the key players who have an influence on the transition from print to electronic systems. The final section comments on some additional relevant issues.

Academic publishing is a small and fragmented sub-industry. The overriding commercial drive is to solve day-to-day, operational issues - to keep the business in profit in the near term - rather than indulge in expensive speculation on the future. The individual small corporate size rarely gives them latitude to invest significant funds in an unfamiliar technology, the implementation skills of which are not readily available in-house. Nor, until the past year or so, has there been any noticeable investment in such future planning functions as 'electronic publishers', in R&D, market research or new product development.

Also, there is notoriously scant market data on which to fall back in supporting business plans for migration into EP. This is not just a problem facing the move to new media; it is equally difficult to assemble reliable market size figures on traditional printed publications, the starting point for publishers. It is perhaps a reflection of the tradition within industry to develop new product in very small niches based on a combination of contacts and the 'publisher nose'.

Corporate decisions are substantiated by subjectivity, rarely hard data. It supports the contention that academic publishing has retained a 'cottage industry' mentality.

There is change, but it is confined to a few individual publishers whose financial resources allow them, and whose concern for the future viability of book and journal publishing drives them. These have launched a series of sporadic and often unrelated forays into EP. The number of such academic publishers can be counted in tens, from an industry which consists world-wide of thousands of publishing units.

It is another distinctive feature of academic publishing that collaborative projects in EP are rare. Even with the highly visible ADONIS, the trials of getting consensus and agreement among the participating publishers has not been easy over the past decade. There have been several other projects which have collapsed, with Knowledge Warehouse in the mid 1980s being a prime example.

Nor has it helped that relations between the library community and (commercial journal) publishers are currently at such a low ebb, heightened by library claims that publishers are 'price gouging' through imposing excessive price-per-page increases on journal subscriptions. It has raised the question in library and policy-maker minds whether publishers have a real role to play in the future if networks take over a significant portion of scientific communication; whether the academic community itself can establish and manage moderated bulletin boards, for example, in place of refereed printed journals. Whether the profit motive can be taken out of the 'social good'.

Publishers have professional experience in managing the flow of information, and offer the ability to structure text, to provide pointers and give quality control which EP systems require. They claim the ability to provide a pragmatic approach to information systems, and avoid the worst excesses of unrealistic visionaries. Scientific information dissemination is too vital for the welfare of research to be the target for projects which aim at marginalising any one particular sector, and being highly speculative without solid foundation. There is a hidden agenda to EP development; that is that publishers and librarians lack understanding and compassion for each other's position, and this needs to be rectified.

A particular battleground which is emerging is that over electronic document delivery. Because of library budget restrictions, 'access' over 'holdings' has become an inevitable acquisition philosophy which transposes to a cancellation of many specialised journals subscriptions in favour of individual article purchase on-demand from one of the many emerging CAS-IAS (integrated alerting and document delivery) services. In doing this the journals themselves, facing a 3%-5% per annum decline in subscriptions, are propelled more quickly into financial deficit. Without compensating royalty payments the existing journal publication system could be dealt a fatal blow.

There is no compensating mechanism for taking over. Publishing on the network is in embryo. At the last count there were only 106 credible electronic titles (out of a universe of approximately 100,000 printed journals). Waiting in the wings, so to speak, are about 5,000 network discussion lists, each of which lack the rigorous refereeing procedures of printed research journals. There is the need for a major social change in authorship, particularly its attitude to esteem, recognition and reward, before the network will come into its own for

publishing purposes. Few quality articles are available only in networked form at present. However, should this change, the difficulty facing publishers is that of surviving the transition from declining printed revenues before growing EP income takes off. A dip in revenues - the 'revenue gap' - could lead to a disastrous period for academic and scientific information delivery.

Many industry watchers point to CD-ROM as a possible salvation. By the end of this year there are anticipated to be more CD-ROM and derivative titles, approximately 5,000, than there are online bibliographic and reference databases (4,500). However, few of these impact on the hard core of scientific information dissemination and would not appear to be the vehicle for smoothing the transition to EP. Support for CD-ROM by the UK publishers is shown in the report to be muted. Questions are raised whether the highly topical needs of researchers are better served through access to remote or local tape services, with regular or real time updates, rather than through CD-ROMs. Whether there are signs of a return to centralised versus distributed delivery, at the expense of CD-ROM; in fact whether CD-ROM is a transient technology. Even less support exists for the electronic book, either in hard wired (HEB) version or as part of the family of DataDiscmen. The interest in the latter is confined to leisure and reference uses thus far.

The attached report lists some of the varied experiments being undertaken by the academic publishing community. In total they do not amount to much. But before this situation is criticised too strenuously, the reasons for such inactivity need to be identified. This report suggests that the fragmentation of the publishing industry has led to some of the narrow-thinking and overly-operational fixation which bedevils the UK academic publishing sector. It also suggests that we do not know enough (quantitatively) about the market or its key players. This is a failing of the research publishing sector, one which could mean that it misses the signposts to the future EP systems, and could lead to them being left down sidealleys or 'marginalised'. Protection afforded by current copyright legislation may not be relevant in future if the ownership of intellectual property rights continues to stand in the way of speedy, effective and relevant information dissemination.

INTRODUCTION

On 6 December, 1992, the chairperson of the IT Working Group of HEFCs' Library Review commissioned a report from DJB Associates which would identify the current status of electronic publishing developments within the UK. This report is due for completion and circulation to members of the committee by 22 January 1993 in time for a meeting of the group on February 5th.

The focus of this report is on the academic book and journal publishing sector. Electronic publishing developments in these areas will have a significant impact on the deliberations within the Libraries Review panel. Academic publishers are loosely defined as those which publish in scientific or scholarly areas where printed books and journals have been the most accepted form of publication.

Whilst there has been concentration on the UK academic publishers, this is a highly international business. Not only do UK-based academic publishers rely on overseas markets, particularly the United States, for more sales than in the domestic market, many overseas-based publishers have a significant impact on developments in the UK scientific, technical and medical (STM) publishing sectors. Scientific and scholarly information is part of an elaborate and interconnected global economy.

The first section of this report will look at various structural issues within the United Kingdom, and whether these are impeding the development of EP by the primary publishers.

BACKGROUND ISSUES

How active have publishers been in developing EP?

International scientific/scholarly publishers have been accused of being ultra-cautious in adopting EP. They have resisted attempts to experiment with optical and electronic formats and have tried to reinforce the traditional printed publishing system. Sanctuary has been sought in the copyright laws to protect their material from being used in EP (electronic publishing) projects.

Such criticism is not new. During the past few decades scientific publishing has been slow to adapt to changing market needs for new media, which has resulted in such implementation being undertaken by agencies outside the conventional publishing industry. Microform publishing was adopted by new agencies led by University Microfilms International and Princeton in the 1960s. Bibliographic database hosting was created by special libraries (Lockheed and SDC) who needed to serve their internal industrial research staff with better information search systems. Most experiments with electronic journals were undertaken using national funds, such as NSF support in the USA (for EIES, see later) and the British Library R&DD resources in the UK (BLEND, QUARTET). There have been few truly publisher-led significant innovative projects.

The image of an ostrich-like approach to new media development has therefore stuck to the publishing industry.

The reasons for this can be:

1. the small scale and fragmented nature of publishing, with its **'cottage industry' mentality**
2. the competitive drive of the constituent publishers which makes it difficult to adopt a **cooperative approach** to new media development
3. its concerns at the **increasing vulnerability of the printed book and journal** on which publishers rely for their revenues and profits/surpluses, and their attempts to shore up these products

4. the failure of so many EP initiatives, and the high financial cost of such failures

Each of the above will be looked at in turn in this introductory section. This will provide the backdrop for an assessment of the impact of the various new technologies (Section Two) and the activities of key publishers in EP (Section Three).

The fragmented industry structure

Though there are no reliable market statistics for the publishing industry - an issue which will be lamented later - it is believed that the UK book publishing business amounts to about £1.89 bil. in annual turnover, and periodicals account for a further £1.6 bil. to £1.8 bil. However, these include a large portion of non-scholarly publications. It has not been possible to assess the core academic book and publishing turnover. Nor has it been possible to determine any comparable statistics on the revenue generated from electronic publishing (EP) media within this sector, though some general figures will be given later. A distinctive feature of this industrial sector is its fragmentation. It is composed of many hundreds of small independent publishing companies. They have a variety of ownership patterns. Whilst a few large commercial conglomerates and learned societies regularly steal the EP headlines, the typical academic book and journal publisher is small in size. Statistics compiled by the Business Statistics Office for 1982 and 1987 show the following dispersion. (These figures relate to the universe of UK printers and publishers, not specifically academic publishers. As such, the numbers in the few employee range are swelled by the many small printing shops and growing numbers of desktop publishing centres).

Dispersion of Size of UK Publishing and Printing

No. Employees	1982	1987
1 - 9	7,582	15,484
10 - 19	1,764	1,831
20 - 49	1,079	1,235
50 - 99	371	385
100 - 199	219	232
200 - 299	84	95
300 - 399	44	46
400 - 499	32	30
500 - 749	30	33
750 - 999	16	15
1,000 - 1,499	12	11
1,500 - 1,999	7	5
2,000 and over	12	7

80% of all publishers and printers have fewer than 10 employees in the UK. According to Peter J. Curwen, 'Publishing represents one of the least concentrated of UK industries'. 'Publishing, unlike printing, is not a capital-intensive process, and it is extremely common for individuals or small groups of staff to start their own imprint'. (Curwen P., *The UK Publishing Industry*, Pergamon Press, Oxford, 1981).

Few advantages accrue from being large in the publishing industry. Certain administrative and distribution functions can be undertaken at less unit cost (centralised buying, marketing and sourcing external finance) with increased corporate size. What the small publisher loses in not having access to the economies of centralised buying it makes up for in smaller overheads, flexibility and manoeuvrability. There are no real monopolistic powers conferred through size. Editorially, a small publisher competes on more or less equal terms with the large publishers. Specialised ('niche') visibility and credibility is important.

Worldwide Distribution of Publishers and Serial/Journal Titles
(source : BH Blackwells database of journal publishers)

	No. Publishers	No. Titles
Publishers with an annual turnover with BHB in excess of £50,000	51	2,854
Publishers with BHB turnover of less than £50,000 but more than £5,000	781	2,996
Publishers with a turnover of less than £5,000	11,232	16,057
TOTAL	12,064	21,907

An example of this can be drawn from BH Blackwells' database of journal publishers. In serving the needs of the library community, BH Blackwell deals with many thousands of publishers both worldwide and in the UK, as the accompanying tables illustrate.

For the rest of the world 12,000 publishers are responsible for producing 22,000 titles (**less than 2 titles per publisher on average**). In the UK, 5,500 publishers generate 13,000 serial titles, slightly more than 2 titles per publisher. Such fragmentation within the serials publishing industry is important in setting the scene for an assessment of scholarly publishers' activity in EP. It will be contended that activity on the innovative aspects of EP is minimal. The main

Distribution of Publishers and Serial/Journal Titles in the UK
 (source : *BH Blackwells database of journal publishers*)

	No. Publishers	No. Titles
Publishers with an annual turnover with BHB in excess of £50,000	66	4,232
Publishers with BHB turnover of less than £50,000 but more than £5,000	206	1,051
Publishers with a turnover of less than £5,000	5,195	7,643
TOTAL	5,467	12,926

reason for this is the very structure of the industry as much as the orientation and attitude towards new developments.

Size of Significant Academic Publishers

The following shows the revenue and profit figures reported in 1988 for the leading UK academic publishers. The figures were reported in a special edition of the STM Directory of that year, not since repeated. The nature of the information makes it difficult to provide more recent financial comparisons.

This gives an average of £5.6 mil annual turnover for the above twenty larger and more visible UK scholarly publishers. If one makes an arbitrary assumption that 2-5% of a company's turnover should be invested in R&D, and that a minimum level of £150,000 per annum would be required to give an effective research programme, only those with a turnover in excess of £3.75 mil would be candidates for new media investment. Several of those organisations with figures in excess of this level are still not involved in EP five years on.

Investment Decisions

The commercial possibilities for new books and journals still pose a risk, particularly with the current declining library funds. However, the investment decision-making process for these products are largely systematised. It takes journals up to five years to reach their hoped-for circulation level; there is ample evidence from the sales patterns of backlists to provide support for forecasts of new book title sales.

This system does not transpose well to new media. The scale of the upfront investments in EP are often a factor greater than with printed publishing. There is also the need for skilled expertise in optical and electronic developments.

Besides which there is a variety of options being confronted by publishers. Should they invest in Compact Disc technologies; online database systems; electronic books; network publishing; electronic document delivery systems? In order to facilitate such new media should the various mark-up languages be adopted (and if SGML, which Data Type Definition) and should page description formats be adopted? The choice is wide, and for a small

Turnover of main UK academic publishers, 1987/8

Publisher	Turnover
Academic Press (UK)	£15.11 mil
Addison Wesley (STM only)	£ 0.25 mil
Blackwell Scientific Publ (STM only)	£10.86 mil
Butterworth Scientific (STM only)	£10.00 mil
CAB Information Services	£ 3.18 mil
Chadwyck Healey	£ 1.62 mil
Churchill Livingston	£ 9.40 mil
Heyden and Sons	£ 4.02 mil
Institute of Physics Publ	£ 8.00 mil
Kluwer (UK)	£ 7.84 mil
IRL Press	£ 1.90 mil
McGraw-Hill (UK)	£ 5.07 mil
MCB University Press	£ 1.77 mil
Mechanical Engineering Publications	£ 0.70 mil
Open University Press	£ 0.03 mil
Oxford University Press (STM only)	£ 8.00 mil
Peter Perigrinus/IEE	£ 0.50 mil
PJB Publications	£ 1.63 mil
Royal Society of Chemistry (STM)	£ 7.59 mil
John Wiley and Sons (UK)	£15.23 mil

organisation with limited resources, without advice, the only effective route is to ignore them and concentrate on the proven immediate financial returns of printed publishing. The economy of scale of printed publishing is low; the economy of scale of EP is a factor higher. It is only now, with the emergence of EP, that there are tangible advantages from being 'large'. The 'cottage industry' scale is a deterrent to achieving adequate penetration into EP; the entry costs are too high for the typical publisher. **The key distinction between print-on-paper publishing, and EP, is that of 'economy of scale' with EP demanding totally different business decisions from those which publishers are traditionally accustomed to.**

Commercial Returns

Most publishers operate on an annual budget cycle. There is steadfast concentration on meeting sales targets for that year on both books and journals in what is increasingly becoming a fraught market. Claims of major cut-backs in library budgets - the mainstay of scholarly publishers - concentrates minds on eliminating waste, cutting costs, reducing margins to the trade, *etc.*

Under these operational circumstances, expending resources on the unknown EP markets would be in conflict with their day-to-day tightly controlled operational activities.

EP Choices facing Scholarly Publishers

Database Publishing
Software development
Audiovisual

Optical Publishing
CD-ROM
Smart Cards

Electronic Books
DataDiscman series
HEP

Separates Publishing
On-Demand and Shortrun Printing/Publishing
Document Delivery

Network Publishing
Bulletin Boards (ftp)
Electronic Journals

Multimedia Publishing
CD-ROMXA
CD-I
CD-TV, DVI, *etc.*

In-House EP
DeskTop Publishing
SGML, TeX, ODA markup
Postscript

Research and Development

The above attitudes were tested out in a small research study undertaken in 1990 (DJB Associates, *The Academic Publishing Environment*, BL Research Paper 84). In this a questionnaire was sent to about 80 academic publishers asking them whether they had an R&D department, whether they engaged in systematic market research, in strategic (minimally five-year) planning or in new product development. In fact any of the 'future orientated' business functions.

The results indicated that in 1990 there were very few instances of publishers having such departments. A few exceptions did exist, but even the household names in the industry failed to systematise on their future planning.

The consequence is that the basic research being conducted into aspects of new media by impartial organisations such as the European Commission, British Library R&DD and Pira/IEPRC fell on stony ground. **There was no interface within the company, no hooks on which such external research results could be hung.** As such some of the valuable work undertaken within BLEND and QUARTET, the research conducted through the ECE's information projects, or IEPRC's work, went ignored by publishers.

In the past few years there are signs that this is changing. A number of publishers have created new posts of 'electronic publisher'. The Institute of Physics Publishing, Bristol, is one example having brought in a person full-time who had experience on the BLEND programme to pilot through their expanding new EP activities. Oxford University Press has considerable internal EP expertise. Pergamon Press has an appointee at director level concerned with internal and external EP publishing opportunities, and a separate market research department. The Institute of Electrical Engineers has an electronic publishing manager. Butterworth-Heinemann has a new appointee, and the Institute of Materials is seeking one. In Europe, Elsevier supports a large department involved in electronic publishing, and Springer Verlag created a new senior post of director of new media developments early last year.

The wind of change is blowing, and the larger publishers are establishing internal departments to spearhead their EP activities. However, there is still a long way to go, and many organisations listed on the earlier table still have no formal internal EP commitment.

Co-operation within the industry

Some of the resistance to experimentation resulting from the above could be tempered by a broad, industry-wide approach to the identifying EP issues, giving advice, arranging for marriages of convenience, *etc.*

Trade Associations

Whilst trade associations offer support in many other industries in making their members aware of the impact of new developments, the role of the trade association within UK publishing was dwelt a blow several years ago when many publishers complained about the

expense of services offered and the range provided by the Publishers Association. Ostensibly it came down to the exceptionally high subscription price for trade association membership, and many larger publishers drifted away. PA reduced its range of activities to a few core programmes, and whilst an electronic publishing panel still exists it has little effective and no executive function.

The same applies to STM, ALPSP and similar trade associations. They are manned by a single or small number of staff who provide a secretariat function. They help with information though only insofar as this can be fitted in with the rest of their secretariat duties. They are not the focus for creating new 'visions' for member publishers in the EP environment. This is left solely to the publishers themselves.

Industry-wide co-operation

Lack of a unified trade association support for scholarly publishers could be overcome if the publishers themselves chose to collaborate on the development of strategic ventures in EP. Again, there is little evidence of this having happened in the past.

Part of the cause could be related to the **highly competitive** and fragmented nature of the industry (see above). Mutual suspicion seems to prevail. Publishers 'are generally concerned more with their individual images than with the image of publishing as a whole'. (Gordon Graham, 'What Publishers Do - from authors to readers', *Rights*, Vol 6, No 3, 1993).

During the early 1980s the PA led an attempt by over 30 publishers to co-operate on the development of the Knowledge Warehouse project, with support from DTI and the British Library. This was to create a central depository of book tapes, parts of which would be licensed to other publishers for a royalty. It did not succeed. Another large cooperative project is ADONIS. Again, the difficulties in getting and sustaining a common agreement with the 40-50 constituent publishers has been, according to Robert Campbell who was chairman of the group until recently, a very complex and time-consuming task.

Small-scale co-operation does take place, but not of the stature required to overcome the high 'entry costs' to EP for academic publishers.

Going it alone

It is then left to publishers to go it alone, and some of the larger organisations have been doing this. Elsevier/Pergamon dominate in this respect, and will presumably do so even more with the £2.5 bil conglomerate which has been formed as a result of its merger with Reed. The Institute of Physics Publishing is rapidly emerging as a leader in the UK. Blackwell Scientific Publishing has a managing director who for many years has maintained a watching brief on the impact of new media. Wiley relies on its New York-based parent, which has a vice president responsible for new product development, to provide similar information support. OUP has produced some successful EP products, whilst simultaneously developing a streamlined internal electronic production system.

But though these larger companies can afford the luxury of such activities, there are many academic publishers which do not have the benefits conferred from size. This particularly applies to most of the ALPSP membership, for example.

The commercial vulnerability of printed book and journal publishing

Journals have become the 'cash cow' for publishers, one which they wish to protect and coddle as long as possible. It is believed that **no commercial virtue exists in jeopardising profits from the printed edition by introducing speculative electronic versions**. These latter compete for the same funds as printed journals, thereby increasing in-house production costs for no new revenues.

However, hard facts are difficult to come by in substantiating such views. Despite the scientific publishing industry being at a crossroads, according to some pundits, with clarity required about the direction to be taken, market data does not exist in sufficient quality or quantity to facilitate effective decision-making on appropriate migration paths into new media publishing.

Availability of market data

Without macro-level market data it is difficult to formulate reliable business plans. The risk element is enhanced. For a typical small publisher, concerned with operational issues, it means a vocal champion for new media is required within the organisation, and speculation takes over from rationality in forcing the new plans through.

Some market data does exist in unstructured and uncoordinated forms. The Information Market Observatory of the ECE (DG 13) has collected relevant forecasts for many years, and its secretariat issue compilations on their impact on the European EP industry. Access to the database itself, however, is restricted to a few members of the directorate. Demographic and other educational data is compiled by UNESCO. Pira publishes *Electronic Publishing Abstracts* as well as EPmap which pulls assessments of new media developments together in a delphic form. National library associations collect data on expenditure patterns, with the Deutsche Bibliotheks Institut offering online access to interrogate their national trends. University Statistical Record and SCONUL offer printed publications of UK university library data, *etc, etc*.

Despite the range of services available there is a dearth in support in developing a common market intelligence system which would provide the sort of data needed for EP planning. Support for such a database was given lip service within STM but in practice there has been no investment. It is another example of the lack of co-ordination between members of the scholarly publishing industry on core developmental activities.

Market threats to printed publishing

The large academic research libraries are the main buyers of international scientific material. Yet there is anecdotal support to suggest that research libraries are cutting down on their book and journal expenditures. This, it is claimed, is due to the 'price gouging' being undertaken by journal publishers, with European commercial publishers being seen as the worst offenders. They are accused of exploiting the soft underbelly of the library budget to saturate the market with unwanted publications. This has had the consequence that an increasing number of vocal librarians, notably in the USA are supportive of the move towards new media systems on the basis that these may eliminate the role of the commercial publisher.

There is a suspicion within the publishing community that the premise of this argument - that excessive price gouging is occurring - is a fallacy and that if this could be understood then the basis for improved relations between publishers and librarians might be possible. A common approach to the funding difficulty could replace the mutual suspicions which currently exist.

The claim is supported by the fact that 'supply' factors - the generation of research information within the international scientific community - is divorced from those factors which create the 'demand' - the purchase of research literature. Supply side factors are stimulated by the ongoing national support for academic research, which in the United States, for example, has doubled in constant value terms in the period 1975 to 1990. Further stimulus for article output comes from the 'publish or perish' syndrome, the need for researchers to be seen to be more productive than their colleagues if only to gain future funding support and career enhancement. As such, the output of information has mirrored the doubling of research funding.

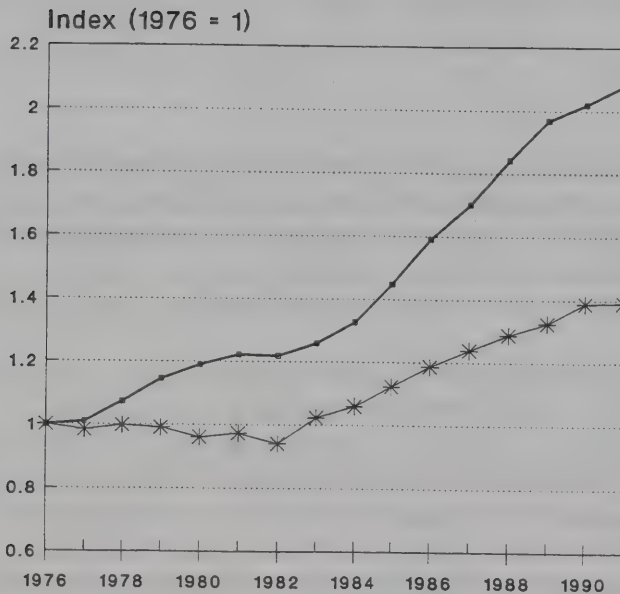
However, the library budgets are dictated usually by local factors - by the academic financial officer. These have to balance conflicting internal campus needs, and the library represents only one of many claims on overhead expenditure. The library, the citadel of learning, has seen its budgets increase by only 50% during the period 1975 to 1990 in the United States (as reflected in the budgets of the 100 or so university members of the key Association of Research Libraries). The following graph was reproduced by Pergamon in a letter (explaining the reasons for the increased journal prices for 1993 to their subscribers), and shows how the 'supply' factors of information generation have outstripped the 'demand' factors. The resulting widening gap can be labelled as the growing 'frustration factor' within academic research libraries.

There has been a gradual reduction in the share of the total university budget passed on to the UK research library during the past decade. In 1981/2, the University Statistical Record showed that 3.89% of the total UK university budget went to the library, and that this fell to 2.8% by 1990/91. (This in spite of the recommendation made by Parry in 1967 that 6% of the university budget should go in support of the library).

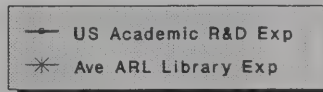
Publishers believe that librarians have been unable to make convincing arguments to financial administrators that their budgets should grow in line with the availability of published information - the 'supply' factors. There are few quantitative indicators which can be used to show that the library is performing a valuable task and the budget level is well spent. As such, other claimants, adopting cost/benefit models which can be more easily

quantified - such as for new research equipment, or for a new department - make more convincing cases.

US R&D and ARL Library Expenditures Constant 1982 Dollars



Sources: R & D - *Science & Engineering Indicators -1991*, National Science Board (Appendix Table 5.1)
Library Expenditure - Association of Research Libraries (ARL) Statistics



The suggestion that publishers are increasing their price-per-page at rates in excess of retail price indices has been popular within the Association of Research Libraries for some time. The counter argument is that the increasing 'twigging' of scientific research areas, with fewer and fewer researchers in each and yet each needing its own publication forum, is leading to an escalating growth in price per page (and fewer subscription sales). The economics of publishing dictate this. There is a high fixed cost element to journal publishing which has to be recovered from a decreasing number of clients. Marginal costs are not the main cost element, representing at best 20% of total costs.

The frustrations and conflict which is increasing between the two communities over this issue could distort the decision-making process on new media introduction for emotive rather than rational reasons. The wider the 'supply' factors grow from library 'demand' capabilities the more such emotion is accentuated. A strong reaction to European commercial journal pricing policy was seen in the Aqueduct Agenda (February 1992) which called for US librarians to boycott specific publishers and furthermore give total support for new media over journals. In this climate support for particular national electronic publishing ventures may be taken for the wrong reasons - for example, to marginalise commercial publishing - whereas in fact publishers themselves claim to have **responded in the best way possible to serving their**

primary constituency needs, the research authors. The new systems may ignore the professional managerial and commercial expertise which publishers apply to the provision of new media systems, and past experience indicates that a purely academic-supported venture could have a limited life-span.

It is clear that both publishers and librarians need to understand each others' motives and operations more fully so that rationality governs their respective policies on EP introduction.

The needs of the researcher

Understanding the needs of the researcher is even further away. There are few effective research studies which see where the printed and new media fit in with the needs of users - where the library can and does provide a valuable role. Publishers are particularly remiss in this area because their future commercial viability rests on anticipating and meeting significant changes in end user needs. The large expense in conducting such research is no real argument.

A particularly interesting assessment of the role of information media among researchers has been made the Faxon Institute for the Advanced Studies in Scholarly and Scientific Communications (1991 and 1992). This non-profit research institute has been funded by the Faxon subscription agency to study how important certain types of information are to the end user. The results suggest that the less active publishers in the new media development may have a good case. Electronic media is seen to have low status as an information source, whereas the refereed and published research article has the greatest support. The study also indicated that the 'personal library/files' was responsible for 50% more so-called information encounters (useful information items that helped in their research effort) than was the case with the library. Future information systems should consider that the personal library is taking over the functionality of the threatened central research library.

In which case, does this signal the rise of the personal consumer (buyer) of scientific information? As will be referred to later, there are some limited examples of the researcher buying information - 40/50% of the individual article requests processed by CARL Systems Inc are paid for by personal credit card, and 30% of Engineering Information's document requests are similarly paid for. This, combined with the switch to 'access' over 'holdings' in acquisition strategy at libraries, is supporting the emergence of personal libraries and the personal buyer.

Whether this transforms into support for new media is more difficult to assess. Again, referring to the Faxon Institute results, there are suggestions that the nature of the subject is a large determinant on whether users in that area respond positively to electronic information media - nearly all the information seeking behaviour of radio astronomers, for example, are to be found in e-mail and file transfer areas, whereas biologists are still happily dependent on the printed material.

However, the studies on user behaviour do not necessarily provide complete or even consistent answers. In 1989 the Centre for Exploitation of Science and Technology undertook a questionnaire survey among 1,000 industrial information users in the UK and concluded that it was 'interpersonal discussions' which were valued above all other sources of information

(second in the 1991 Faxon study). Learned journals, conferences and trade journals represented the declining rank order from the CEST survey. If two major surveys conducted on information users in the same time period display a radical difference in ranking of significant information sources, it provides confirmation that available quality market data is not all it should be.

THE MAIN EP TECHNOLOGIES

This section looks at the main electronic publishing technologies and the involvement of publishers in each. As an introduction, the following table gives the value of each of the main media in the United States as reported in the *US Industrial Outlook*.

Value of Different Media in the United States
(in \$ billions)

Media	1987	1988	1989
Newspapers	31.8	33.0	36.6
Periodicals	17.3	18.9	17.3
Books	12.6	13.6	17.3
Electronic Media	-----	6.2	10.8

The emergence of electronic media is dramatic, even though very little of it can be applied to the academic sector.

Database publishing systems

The value of the UK market for hosts and databases is approximately £1.65 mil - a size which is almost equal to the printed books or printed journals industrial sectors. However, a large proportion of the database business - some 60% - is accounted for by real time financial/business information. There are about 350 databases being produced in the UK. The world-wide count is over 4,500.

Growth in this industry has not been as spectacular as had been forecast in the early 1970s. Difficulties with complex access protocols, a variety of search and retrieval languages, the vagaries of telecommunications, and foremost, the pressure exerted from charges being incurred according to length of connect time, meant that bibliographic database publishing was something which was confined mainly to the periphery, and supported principally by secondary abstract services. In a study undertaken by Harry East (*Balancing the Books - Resourcing*

Electronic Information Services in Academic and Public Libraries, Centre for Communication and Information Studies, Paper No.3, June 1991) the expenditure on online database searching within the typical university library was shown to have fallen from £9,300 in 1988 to £8,900 in 1990 (based on sample of ten). Whilst recent years have seen some of the traditional problems being addressed if not resolved, database publishing in the USA grew only 6.7% in 1991 (Simba), and by 12.6% in the ECE. In many sectors, database publishing has moved into maturity without achieving the early startling results which had been promised.

Only a few databases of the 4,500 available are used to any significant degree. In the UK, 25 databases are believed to account for 80% of usage. These include, with UK university percentages given in brackets, Inspec (13%), Lexis (10%), Medline (9%), CAS (7%), Biosis (7%) and Compendex (5%). Each of these is a comprehensive service within its own broad subject area. Each is large and expensive to maintain. Many of the 'tail' databases generate usage below a commercially viable level, a feature particularly in Europe where public subsidy of databases and host services has become more prevalent than in the United States. Few organisations in this business make profits - even the host market leader, DIALOG, when sold to Knight Ridder several years ago, showed how small the margins were in this business. 48% of all online database vendors used in UK universities is through DIALOG (Harry East, *Balancing the Books*). Despite this it has low profitability; it is not a sector to attract the attentions of the commercially-minded primary publishing industry.

There is a correlation between size of database publisher and the proportion of total receipts coming from online. The larger the database publisher, the higher the online proportion. From a study of 144 UK databases in 1990 the following are the dispersion of revenues between print, online and other (CD-ROM, microform, etc).

Dispersion of revenues by medium of publishing
(UK Database publishers, 1990)

Medium	Small	Medium	Large
Print	57%	35%	28%
Online	20%	39%	66%
Others	26%	27%	6%

The difference between large database producers relying on online for 66% of their revenues, whilst small publishers receive 20% on this form, is striking and endorses the view of their being more **economies of scale to be reaped in electronic media rather than with print.**

Large databases accessed remotely may still have their day over what is considered in some quarters to be a competitive technology - CD-ROM. The latter has advantages in terms of allowing less pressurised searching, but in a volatile world the access to online databases with real time updates offers growing benefits. A leading 'virtual library' in the United States

(University Southern California) has no CD-ROM players, only easier access to a variety of local and remote electronic data sets. The database business may have begun to move full circle - it started out by leasing tapes to a few large customers, which resulted in the emergence of the online industry; we are now witnessing a return to tape leasing by centres serving large numbers of researchers and students.

In the UK we are not served by a well-developed database vending service. Most of the key players - DIALOG/Datastar, InfoPro Technologies, ESA - are based either in Europe or the United States. The early InfoLine has taken on many iterations and is now confined ostensibly to providing commercial and business information. BLAISE is confined to serving a narrow range of library databases. Though the lack of a strong vending/host service may not in itself be an inhibiting factor, the balance of trade on electronic publishing results in a net import of data over export. Only in the financial sector can we see the development of significant international market shares by UK-based hosts and databases such as Reuters, FT PROFILE, EXTEL, *etc.*

Database markup languages

The development of an in-house neutral database, around which drivers would be set to create a range of new media - online databases, CD-ROMs, microform and the printed publication - without the need for restructuring the text each time, was investigated in some depth by Pergamon in the early 1980s. The study was terminated for cost implementation reasons, and it was not until the publication of the ISO standard on SGML (Standard Generalised Markup Language) in 1988 that a new phase of considering the creation of centralised and neutral databases was entered into.

The ISO standard was enhanced for publisher purposes by the American Association of Publishers, with the AAP producing a guideline for the enhanced preparation of electronic manuscripts. Even this was not sufficient for the needs of particular research journal publishers, and several have developed their own DTD (Document Type Definitions).

Elsevier has its own DTD, developed with an eye on the needs of its large and varied journal publishing programme; another group of European publishers has established a separate SGML working group with a standard known as MAJOUR. A *de facto* standard on journal article headers has been published by this group and they are now turning their attention to defining SGML standards for the body of articles.

There is a cost in moving into text markup systems - various estimates have been given by different publishers, but several pounds extra per article header can be involved. This extra cost can only be justified if it is seen to produce commercial advantages in the foreseeable future - if viable EP new media develop. Selling the header files to secondary database services and other intermediaries is one source for revenues to offset SGML implementation costs. But is it enough?

There is now a widespread interest in adopting SGML standards within many publishers. Some have responded to the large amount of TeX formatting of documents being undertaken in the physics and mathematical areas, where tabular, formula and non-standard text elements are

critical. Others are looking toward the future of multimedia needs and investigating ODA (office document architecture). Whatever system is adopted, it is a good sign that publishers are committing themselves to a rigorous set of rules in structuring the manuscripts they receive.

Receipt of manuscripts electronically

A misconception exists that if an author supplies an article on a word-processed disc, this leads to cost savings. Some publishers prefer to rekey the text rather than get involved in the expense and technical problems of converting one from a wide range of WP or DTP systems into the house style on the accepted disc size. A survey carried out by the American Association of Publishers (AAP) indicated that 36% of all accepted manuscripts were received electronically. In Europe a separate survey showed that, in the physics community alone, there were 100 different word processing and 100 different computer systems in use in generating research information. With few of these authors adopting full SGML markup - because of its complexity - the headaches faced by publishers in data conversion are considerable. There are conversion boxes and bureaux but these can be expensive solutions and not compatible with internal editorial operations.

Optical publishing

CD-ROM, CD-ROMXA, CD-I

Lack of accurate statistics again makes it difficult to paint a true picture of how significant CD-ROM publishing has become in usurping print and online in any of the key markets. There are several incompatible estimates. The most credible is that produced on an annual basis by InfoTech, Vermont. The latest available data suggest some 2.5 million CD-ROM, CD-TV and DataDiscman drives existed in 1991. 600,000 of these are in Europe, and 185,000 of these are UK estimates (though a separate study by Keynote only gives 31,500 for the UK).

There are nearly 400 domestically-produced CD-ROM titles (out of a world total of 3,600 (source: *The CD-ROM Directory*, 1993 edition, TFPL, London). Most of the leading UK publishers have a few CD-ROM projects. None see this as a significant medium for them. Pergamon in particular, with its earlier adventure into Pergamon Compact Disc, has withdrawn from actively pursuing new CD-ROM titles. (Two titles which it had developed are no longer available). The reason which is usually advanced for this is that there is no significant demand in evidence; the CD-ROM readers are still relatively few, and purchase of the expensive academic discs is minimal. Sales of 300 CD-ROM discs at commercial price levels (£500 to £1,500) is doing well.

From the TFPL 1993 Directory, the following numbers of CD-ROM titles are listed against the main academic publishers:

Number of CD-ROM Titles by Publishers, 1993

Bertelsmann Information Services	11
Blackwell Scientific Publications	1
Bowker-Saur	6
Chadwyck Healey	16
Chapman and Hall	3
Elsevier Geo Abstracts	3
Elsevier Science Publishers (EMBASE)	1
John Wiley and Sons (USA)	3
Kluwer Academic	1
Longman Cartermill	3
Longman Group	2
Oxford University Press	5
Pergamon Press/Rapra	1
Springer Verlag	6

The technical issues of poor data rate transfer (100 times slower than PC processors) and the difficulty in losing control over the data if the CD-ROMs are networked over a broad network are other constraints. Pricing for networked CD-ROMs is a function still in its infancy - only 22% of 1992 available CD-ROMs had a network price, and this is in itself up considerably from the 13% in the previous year.

However, the most significant reason for non-participation in CD-ROM development was that the business suffers from a 'chicken and egg' syndrome, and the different estimates of players *in situ* (see above) does not convince publishers that there is a buoyant market for academic/research level CD-ROMs. A telephone interview conducted among ten academic publishers in September 1992 to see their reaction to developing CD-ROMs for a third world market in particular showed that there was even less interest in this area as it traditionally only filled 5-10% of the subscription base. In general, the impression was that CD-ROM was not a crucial product nor central to an EP strategy. Only 8% of TFPL's list of CD-ROMs are categorised as Science and Technology, and a further 7% are in Medicine. (General interest, arts and education are responsible for over 40%).

CD-Interactive and CD-TV are seen more as educational and general reference publishing systems. With CD-I the earlier points made about high entry costs are particular apposite - the investment in programming and hardware exceed anything usual within the editorial programmes of academic publishers.

The CD-ROM, CD-I, CD-TV and related compact disc publishing formats are therefore being developed not by the mainstream scholarly publishing business. There are new organisations emerging to handle this. SilverPlatter had its roots in the library automation business in the US before it became a front-runner in CD product development. Microinfo grew out of the microform business. Abbey Information and Clarinet emerged from the software industry.

Multimedia

Not unexpectedly, the above CD-ROM formatters have latched onto the multimedia capabilities of CD-ROMXA to provide new value-added services. The number of multimedia titles have grown from 40 (in 1990) to 809 (1993). Within a few years multimedia products are responsible for over 20% of the titles available.

Making a multimedia product, particularly if digital sound is involved, requires expertise which rests within movie and television studios rather than traditional academic publishing. Not only does it require a different editorial skill it also has significant impact on the ability to license (particularly sound recordings) at acceptable costs.

Smart cards

Data stored on the magnetic stripe of credit cards allows a minimum of 2 megabytes of data to be accessed. This has been applied primarily to personal medical records in experiments conducted in the USA and the UK (the latter by British Telecom). Though in principle it offers an interesting way of distributing 'customised' information from a central data store to individuals according to their respective profile of interests, it still has to catch on. So far there is negligible experimentation in this area within publishing, partly because of the long delay in the Japanese suppliers providing suitable card readers with robustness and at low cost.

The electronic book

There are two levels of electronic books which might attract the interests of scientific publishers.

Handheld electronic books (HEBs)

These have emerged since the mid 1980s on the back of a convergence in technology between declining memory costs, more effective display systems, improvements in power supply, effective data compression algorithms and new ways of input technology (from keyboard to touchscreen, for example).

Two New York-based organisations with their feet in computer hardware/software camps were responsible for developing portable terminals which included information (software) hard-wired into the unit. These companies were Franklin Electronic and SelecTronics. They developed portable calculator-like devices which contained dictionary, translators, bibles and spell-check information. They came into competition, in the early part of the 1990s, with larger organisations interested solely in shipping high numbers of hardware units - Seiko, Texas, Smith Corona - which added the same sort of information (software) at give away prices. This undercut the market for the two earlier leaders who traded on giving quality information, but at high unit sale prices. They both have barely survived financially.

These calculator-like 'books' are not in the mainstream of academic publishing developments. There is no indication that they will be used as a replacement technology for the book or journal in the near future. As such their role remains that as a useful reference tool.

A more interesting development was announced by Megaword, an Australian company, some 4-5 years ago. This involves a single lightweight unit being used to play a number of book packs. Publishers such as OUP, CUP and Wiley were allegedly signed up to provide titles for these packs, but to date there has been no information about the launch date of the 'Smart Book' as it is being called. (See Tony Feldman, *The Emergence of the Electronic Book*, BNBRF 46, and *Further Developments of the Electronic Book*, BNBRF 57, as well as his contribution to this volume).

DataDiscman

A new generation of electronic books have arrived with the launch in July 1990 of the Sony DataDiscman (DD-1). The enthusiasm for this CD-ROM based system (3" discs) was bolstered by the sale of 200,000 kits in the first year in Japan. A staggered roll-out throughout the rest of the world has occurred, with Germany (Nov 1991) and France (April 1992) preceding the launch of the DataDiscman in the UK in July 1992.

A feature of this product launch has been the active attempt by Sony to include publishers in the product development - to entice them to include a range of titles which can be played back through the readers. Up to three titles are usually bundled in with each DataDiscman sale in the UK, but through the establishment of national and international electronic book committees, active promotion to publishers is going on at a scale not experienced hitherto with EP.

The standard DD-1 unit (priced at just under £350) contains 230 megabytes of storage on the 8cm disc, or about 90,000 text pages. Enhancements to this have been offered in recent years, with special features such as slimmer units, backlighting and graphics display (DD-1EX), slimmer models (DD-10EX), as extensions to PCs (DD-DR1) and offering audio and other refinements (DD-8).

Few scientific publishers have shown interest in this format. Wiley has participated as a member of the UK electronic book committee, but for the rest it is the leisure and general publishers who see the niche for the DataDiscman as a portable device for giving reference type information to travelling professionals.

Electronic on-demand printing and publishing

As the print runs for books and journals get shorter, increased emphasis is placed by publishers on making shortrun printing and publishing profitable. This combines with some traditional publishing needs - avoiding the problems associated with declaring works 'out-of-print' - and some library activities, that of preservation and conservation particularly of brittle or acidified books.

In the past microfilm was the backup technology, but with digitisation a new set of options have been revealed. Perhaps the most notable of these is the so-called PRIMIS programme from McGraw-Hill in the USA. PRIMIS has a different ancestry - it stems from a concern about the amount of on-campus copying done by repro shops of anthologies of articles from (McGraw-Hill's) textbook programme.

In combination with RR Donnelley (USA's largest printer) and Kodak Eastman, a system was devised whereby a professor could select those papers from the McGraw-Hill business textbooks which would be used by his students during the forthcoming semester. These would be produced as a sample by McGraw-Hill within days, and if agreed, a print run would be determined which Donnelley would fulfil again within days of selection. The price (per page) would be comparable with local print shops but the quality of the end product would be infinitely better, and copyright issues would not be abused.

McGraw-Hill gave notice to all its printers that they would have to adopt Postscript as a page formatting system (or lose the business) and this gave the structure necessary to reach the commercial and technical targets.

Despite the significance of this development to academic textbook publishers, and the open invitation made by McGraw-Hill to other publishers to join in the system and enable the catchment of articles available for selection to be increased, there have been no takers. Other publishers are still waiting and uncommitted. PRIMIS, meanwhile, has been in operation for two years. This is another instance of publishers being concerned at letting their competitive guard down, and collaborating with the competition on operationally core issues.

Electronic document delivery

A crucial and immediate challenge which scientific publishers face is that, given the decline in effective library purchasing power compared with the continued growth in research material output, publishers are seeing a switch from 'just in case' library acquisitions to 'just in time' purchasing. This manifests itself most visibly in the rise of the individual article over pre-bundled journal subscriptions.

Photocopying of journal articles has been a feature of the information scene for several decades. BLDSC has grown so that it now processes over 3.2 million requests per annum for article copies and book loans. It is estimated that there are 41 million formal article requests being fulfilled world-wide each year - this is just the tip of the iceberg as informal photocopying on campus, and the exchange of preprints and reprints, also swell the annual 'separates' traffic to in excess of 100 million items. However, where there is a commercial charge levied on an article supply, this in aggregate now represents almost 20% of the total journal subscription business (of £1,700 mil pa).

Thus far, very little of this 'separates' money has found its way back into the primary journal publishing system. It has been parasitical to the journal, flourishing only insofar as the original journal still exists, and doomed to cease as and when the subscriptions (which it replaces) renders the journal no longer viable. Whilst the article supply was essentially 'passive', in response to a citation provided by a colleague or an online search, the article

supply business posed a containable threat. Ventures such as ADONIS were designed to cope with this business (see below).

However, a fillip to 'separates availability' has been given in recent years by the dramatic increase in resources being put into a new concept known as CAS-IAS. CAS-IAS stands for a combination of Current Awareness Services with Individual Article Supply. Where it differs from the old document fulfilment systems is that it provides a front-end service, one which allows librarians and individuals to identify what has just been published in the world's scientific literature. It offers a broad-based 'article catalogue'. Any item from this topical catalogue can be ordered and delivered to the end user (by fax) within 24 hours of request.

CAS-IAS' topicality provides the potential for stimulating more article requests. It also provides a comprehensive overview, exceeding the coverage of even the largest of the international abstracting and indexing services by a factor of two to three times. (Typically, 10-12,000 titles are covered in each of the eight or so new CAS-IAS services). More significantly, it offers the opportunity for cancelling hardcopy journal subscriptions (particularly of the lesser-used and more esoteric variety) and substituting an on-demand purchase of articles in its place. Prices for article delivery range from £6.70 to £12 per article - given the value-added features of the service, not extortionately higher than the near £4 for BLDSC's subsidised (and unpromoted at article level) service. These new CAS-IAS services also include a royalty payment to publishers. In the case of US-based services, they represent CCC rates of \$3-\$4 per article on average.

What has made this area so topical is the sheer numbers of strategically positioned organisations which have entered this business in the past few years. ISI (Institute for Scientific Information, now within the Thompson Group) has been a commercial publisher offering a low-profiled article delivery service for many years (combined Journal Contents Online database with Genuine Article backup). Until recently it lacked an effective network on which to host its 'awareness' file. This was not the case with CARL Systems Inc. In 1988 it established its UnCover1 database of citations to articles from 11,500 journals - the combined collections from the eight main research libraries in the Denver, Colorado area - and in the summer of 1991 launched UnCover2 which provided a complementary document delivery backup. CARL has its own dedicated network spanning the continental USA and Hawaii, and also allowed access to UnCover through Internet. Individual researchers could buy articles online, have them delivered as a fax within 24 hours, the transaction being paid for out of a deposit account or through a credit card. During the first year of UnCover2 operations nearly 25,000 articles were bought in this way. The number is rising dramatically, and the recent formation of 'The Uncover Company' (a joint venture between BH Blackwell and CARL Systems Inc) will enable the system to be enhanced to 20,000 titles, and made available world-wide supported by BHB's regional offices.

CARL Systems Inc no longer offers a unique service. Faxon Research Services was established in 1991 to offer a similar integrated awareness and document delivery system, with orders being processed through the network. The rationale behind Faxon's entry is that subscription agents - of which Faxon is the world's largest dealing with scientific publications - could no longer rely on the stability of the journal to provide them with their future security. Not only were subscriptions under pressures, but the agents margins were being squeezed by both publisher discount reductions and library service charges being more competitive. As

such Faxon initiated its move into 'just in time' information support, and declared in 1991 that it anticipated half of its revenues coming from such services in five years (with a decline in signification of its subscription agency activities). The Faxon Research Services Inc (FRS) set of product/services are currently being launched in the USA, and expected to be migrated to Europe in the near future.

Other international subscription agents have also followed quickly. BH Blackwell bought into the under-resourced CARL Systems Inc operation (see above), and Swets has made a database of article citations from 6,000 journals available to the Dutch PICA library utility as from January 1993. EBSCO and Dawson are expected to announce their own CAS-IAS services in the next few months.

Not only are subscription agencies impelling the move from subscriptions to articles, but so are library utilities. PICA, the Dutch academic research library consortium, is making its RAPDOC service based on Swets available in Holland and possibly Germany in the near future. OCLC and the Research Libraries Group have been equally active in the United States. OCLC originally planned to mount the Faxon Finder (alerting service) through their FIRSTSEARCH and EPIC networks - reaching several thousand library institutions - but has more recently announced its own version of ContentsFirst and ArticleFirst services. Some of the records to support both these services are bought in from third parties, including Faxon. However, OCLC is responsible for the database front-end which enables researchers to recreate on the screen any issue's table of contents (ContentsFirst) or to undertake a generic search of authors or keywords (ArticleFirst). The Research Libraries Group offers its CITADEL (citations and delivery) service whereby bibliographic databases are given a common front-end search procedure, and items on any of the databases can then be ordered from a number of affiliated document delivery centres. Rapid turnaround in article order fulfilment is again guaranteed, with those institutions investing in the inexpensive ARIEL software also being able to have the image of the article delivered to the screen through Internet or RLG's own dedicated network (RLIN).

Again, a new entrant in the CAS-IAS area in 1993 is the British Library Document Supply Centre. In early January, 1993, it launched 'Inside Information', a tape service which gives the citations to articles from the 10,400 most requested journals being received from BLDSC's acquisition of 53,000 titles. The database is created by an offshore keyboarding centre in the Philippines. The database is sent to New York from where it will be distributed to those customers who wish to have the full file or even subsets on a subscription basis. The logic is that if this file gets as wide a distribution as possible, the article traffic which will be generated will feed back to Boston Spa for document fulfilment. Their aim is to double the document delivery traffic by the end of the decade; 'Inside Information' is seen as a tool to help this. (It is also envisaged that BLDSC is an ideal position to pick up the new article business generated by the other CAS-IAS services mentioned above). A CD-ROM version of 'Inside Information' - a monthly disc - will be produced from April 1993.

To make some sense of these various offerings, one can consider a spectrum in 'catalogue entries' from an article store. Some offer very limited amounts of information about an article (UnCover from CARL and 'Inside Information' from BLDSC); others consider it is essential to offer at least abstracts to enable end users to make a more informed decision about what they are buying (ISI); others even provide images of the first page either through the network

(Engineering Information) or from a CD-ROM disc (ADONIS). The longer the catalogue entry the less topical the record becomes, and the more the service merges into conventional A&I services.

As can be seen CAS-IAS is a rapidly-moving area. The inevitable conclusion is that with all these resources committed to making it easy to identify relevant articles and to order them online, the article sales will rise and the journal subscription business will continue to fall.

This gives a headache to publishers. In the case of BLDSC fulfilment, only a small proportion of the total requests (5%) fall within the Copyright Cleared service which the BLDSC entered into with the UK-based Copyright Licensing Agency. At £1.25 per article, even this is insufficient to offset the decline in subscription income. USA rates of \$3 to \$4 for all CCC member publishers is seen as better. However, simplistic modelling, using assumptions about journal prices, declining sales, emerging 'revenue gaps' and the extent which article royalties can fill this, exposes a major commercial problem. Because of limited usage rates of journals (in catering for the 'just in case' syndrome) articles would have to have royalty of about \$15 and a doubling in annual growth rates to enable royalty revenues to fill the journal revenue gap. This royalty rate would be in addition to the processing costs of CAS-IAS suppliers of a further \$10-\$15. The combined price would be unacceptable to the user community, forcing a return to the traditional fulfilment systems offered by BLDSC, INIST, ZBM, *etc*, which give no royalties.

More to the point, the growth in article sales which the new CAS-IAS agencies will stimulate will lead - over the next five years - to an expansion of the market from the current 41 million items to 60 million. During this same period the total journal subscriptions may have declined by the current rate of 3-5% per annum. This means that instead of the current ratio of 5:1 (journals to articles), the revenue will become 5:2 with serious consequences on publisher profitability and viability.

The BIDS Service

The Bath Information Data Services (BIDS) has been a remarkable success in anyone's book. It was a project supported by The Information Systems Committee of the UFC by which universities in the UK would be able to subscribe to an online database consisting initially of the full ISI datasets. Bath University won the contract to host the service, and within a few months over 60 academic centres in the UK enrolled. This involved them each paying £5,000 (for charter members) or £6,000 as a fixed annual fee and in return would allow all their students and researchers to access the files through JANET 'free at the point of usage'. The age-old problem of high connect charges was eliminated, and the system was seen to be attractive to end users.

Within eighteen months the number of daily accesses to the ISI databases rose to 2,500 in staged increases. UnCover, which has been going longer but only within selected institutions in the USA, has now reached 6,750 accesses per day, suggesting that there is still some growth potential left in the academic system. BIDS staff like to quote that if this usage was costed out in conventional commercial terms - an average of £30 per search - the annual turnover would be £22.7 mil per annum, achieved in just over a year. EMBASE has been launched using the

same formula, but its more specialised (medical) orientation defies a true comparison with the ISI files.

BIDS has highlighted another problem in the EP development by publishers. Though ISI receives 50% of the annual subscription from the universities as a royalty, it jeopardises the equivalent hardcopy subscriptions. Thus, ISI is trading £2,500 per site royalties for £10-14,000 per annum in cancelled printed subscriptions to their citation indices. There is a risk that the delicate commercial basis of their database generation system is threatened if the BIDS system is replicated too closely in other countries. It puts into focus the difficulty publishers have in balancing the (sometimes competitive) revenue streams from printed publications and EP. It is a widely held assumption that at the end of the five year contract, ISI will not be willing to renew the agreement under the existing commercial terms.

It does show that an EP service, if it meets a niche market need and is priced according to the wishes of the end users, then it can become successful in a relatively short period. The problem is that reaching an equitable pricing strategy for information providers on this EP system is no easy achievement.

Meanwhile the loading of datasets through CHEST on host computers in the UK continues. Whilst Bath has been successful in bidding for the ISI and EMBASE services, there is no guarantee that they will host all the other services which could be added to the JANET network. Nevertheless, BIDS is seeking to complement the alerting service offered through ISI with an article delivery backup - currently not in place - thereby becoming another member of the growing CAS-IAS band.

ADONIS

ADONIS has a twelve year history of development. It emerged as a collaborative response by a small group of commercial journal publishers in Europe who felt they could work together to tackle a common and severe challenge facing them all - the photocopying activities of agencies such as BLDSC. By investing in new technology which would undercut the traditional manual-based photocopying, the consortium would not only divert document delivery demand to the publishing sector from BLDSC et al, but at the same time allow royalties to be paid to those publishers who owned the copyright. The pioneering days of ADONIS were exciting - the use of state of the art WORM discs, storing several gigabytes of image information, and transmitting these to all large campus by satellite, was one of the earlier design concepts.

ADONIS now has two levels of publisher involvement. There is a small group of ADONIS bv owners, which consist of:

Elsevier Science Publishers
Pergamon Press
Blackwell Scientific Publications
Springer Verlag

These hard-nosed publishers learnt that what was technically possible was not always commercially feasible, and ADONIS had to await the arrival of a cheap workstation - the CD-

ROM reader - to enable its broad aims to be realised. The migration from a centralised to a distributed method of article distribution was accomplished in the mid-80s, and a number of pilot experiments were undertaken in the following years.

The owners of ADONIS fund an administrative and sales office in Amsterdam, and a sales office in the USA. The headquarters are still at Elseviers in Amsterdam, and Elsevier - with its acquisition of Pergamon - has a significant say in the long-term development of the project. The second level of participation is that of contributing publisher. Some 40-50 medical publishers send relevant journals to the ADONIS office and pay for them to be scanned onto a CD-ROM master. EMBASE (an Elsevier company) provides a limited indexing of the articles used for display and printout of ordered documents.

The current status of ADONIS is that a further period of self-evaluation is occurring. The response from the market in terms of usage of the discs (and the payment of royalties) has not matched the sale of the ADONIS workstation subscription itself. Approximately 100 ADONIS sales have been achieved, but many (including the BLDSC unit) are not being used in anger. Publishers, who pay to have their material included on the ADONIS discs, are not being reimbursed sufficiently by the royalty stream and are getting fidgety. A new concept for ADONIS III may be required.

What this will be is open to speculation. Certainly, ADONIS has a strength in that it has brought significant publishers together to address the problem of providing a source of revenues (from article royalties) to compensate for the decline in journal subscription revenues. It is debatable whether this is enough to keep an effective and unified electronic document delivery in place.

Network Publishing

IoPP/SCONUL/BLR&DD/Loughborough University

Loughborough University of Technology (Jack Meadows and Cliff McKnight) have been awarded a contract by the British Library R&DD to study the electronic delivery of a research journal in parallel with the printed version. The objective is to assess the various factors which are involved in such parallel systems, including the costs, human factors, organisation and technology of the electronic journal.

The Institute of Physics Publishing Ltd is the publisher involved, and the title is *Modelling and Simulation in Materials Science and Engineering*. A number of test sites will be involved in taking the electronic version; though no final selection has been made the names of Loughborough, University College London, Imperial College and the Atomic Energy Authority, Harwell, are mentioned.

The project has the backing of SCONUL, through their Task Force on Electronic Journals. SCONUL is also represented by two librarians on the project committees. This, together with TULIP, provides an example of the degree of co-operation which can be reached given goodwill on both sides, publisher and librarian.

SPIRS (Publishing Group)

Having earlier suggested that publishers find difficulty in co-operating on strategic initiatives, the exception to the rule could be a new project being started by a small group of publishers as part of the SPIRS development.

A group of publishers met with the SPIRS (SuperJANET Project on Information Resources) committee in June 1992, and an *ad hoc* committee of a dozen publishers, united solely in their ambition to be active in some way in SuperJANET developments, has been meeting regularly. A demonstrator project has been agreed which will enable all the constituent publishers share the costs and learning curve in putting articles on the network. It is intended to select articles which make exceptional demands on the bandwidth of the network. It is felt that the 1,000 fold increase in capacity of SuperJANET over JANET will allow colour illustrations in articles, for example, to be delivered directly to the enduser.

A technical committee of the constituent publishers, and a group from Edinburgh University (an early SuperJANET node) are working to establish a demonstrator project by April 1993. The British Library R&DD has provided in excess of £50,000 in financial support, and a project manager has been appointed for three months to get the system together. Each publisher of this group will be asked to deliver material as part of this demonstrator.

The following publishers have been involved in the demonstrator:

Companies Involved in the SPIRS (Demonstrator) Project

Cambridge University Press
 Oxford University Press
 Macmillan Journals (*Nature*)
 Institute of Electrical Engineers
 Rapid Communications of Oxford (a Thompson Co.)
 Sage Publications
 Pergamon Press
 Blackwell Scientific Publications
 Institute of Physics Publishing

The decisions having been taken to proceed, and the operational guidelines set in place, the management committee of the above SPIRS (publishing) group has been disbanded. It is hoped that a new group will arise, leaning heavily on the earlier SPIRS membership but extended to include other publishers, to establish the Electronic Journal Testbed (EJTESTBED). This is a much broader concept, enabling a facility to be created whereby publishers can gain even greater experience from EP through the network. Funding for this longer-term project is being sought.

Whilst on the surface it has elements of the Knowledge Warehouse, and an exclusivity in its membership, it is not felt that this heritage would necessarily bode ill for the project. It also has similarities to a project which has been touted around the corridors of the European Commission - and may get some funding under IMPACT2 - which involves the establishment of a MULTIMEDIA LAB. The political hurdles which still have to be overcome before this gets funded, being championed most consistently by IEPRC (International Electronic Publishing Research Centre), are still significant.

The chemistry which has been created within the SPIRS (publishing) group is such that inter-publisher competition has been temporarily sidelined in favour of a keenly and common felt need to be part of the network publishing world.

TULIP (Elsevier)

An equally ambitious project on exploring the needs of network publications has been launched by Elsevier and Pergamon in Autumn 1992. There was a delay in starting TULIP - The University Licensing Program - caused by the sheer scale of the financial commitment required for the three year experimental project, a scale which was significant even by Elsevier terms.

The aim of TULIP is to explore the different options of delivering material to libraries and end users through their local area networks. The source material is the 42 material sciences journals which are published by Elsevier and Pergamon. TULIP differs from some of the other purely electronic journals because it relies on the existence of a printed journal. Many of the constituent titles are available on CD-ROM; TULIP is being looked at as a step beyond CD technology.

Elsevier is putting a database together, the record structure of which consists of article headers in an SGML coded form, the entire article as a scanned image and an ASCII file which represents an unedited optical scan and character recognition of the image. These three elements will be put onto a WORM disc and shipped to Engineering Information in New Jersey which will act as Internet server and database host. Ei will maintain profiles for each participating university and will send the appropriate updates over the Internet to the local university server. In addition, Ei will build a database of all ASCII and image files to be held for possible new future participants. There are ten universities taking part in the three year evaluation. A further five university libraries will be observers in the first instance.

The aim of the three year project is to establish user requirements for such data, the optimal delivery methods, pricing algorithms which can apply, *etc.* From a library perspective, the attraction of TULIP is the possibility of speedier delivery of information, in saving library patrons' time and the ease of accessibility. Economic, technical and legal issues involved in the electronic transmission of journals will be explored. A key issue is to see whether, through the payment of a single, annual license fee, the usage of the file grows in the same way as that demonstrated by BIDS.

A Generic electronic journal (SEPSU)

An imaginative proposal has been put forward by Sir Peter Swinnerton Dyer to establish a general electronic journal which would be created and owned by the academic community. SEPSU (Science and Engineering Policy Studies Unit), with Royal Society support, has been developing a practical system based on Sir Peter's concept. This has been moving forward slowly.

The proposal has caused concern within certain parts of the UK commercial journal publishing fraternity as it is perceived to be an attempt to by-pass them and make them redundant to future publishing on the networks. The claim being made by the publishers is that without professional management and an appreciation of the importance of commercial/marketing issues, the SEPSU project will be a failure and government funds would have been committed needlessly. It is argued that academics would be unable to run such a system. Jumping in with such a sensitive project in a critical area of scientific communication could do more harm than good, it is claimed.

In a separate multi-client study produced by David Worlock and David Brown (published by Electronic Publishing Services Ltd in December 1992) some fundamental strategic questions were raised about the role commercial and learned journal publishers could have in the development of network publications. The existing functions performed by publishers - some ten in number - were evaluated in the context of how each would apply in a networked environment. The conclusion was that the set of functions which involve describing the content of an articles - its internal and external pointers; the 'crunching and tagging' - are ones which are best left to the professional publishers, whereas most of the remainder can be performed by others on the network or the network itself. The recommendation was that all publishers sincere in their wish to be part of the EP revolution should immediately become active in particular aspects of networking, and a list of how this could be done was outlined in the report.

Online Journal of Current Clinical Trials:

Though not available in the UK, the collaboration between OCLC and AAAS (American Association for the Advancement of Sciences) has signalled a highly visible networked journal established in the USA. Available on an annual subscription basis (\$95), plus additional charges for local printout and delivery of information, the new journal provides a rapid publication system whilst not compromising on editorial quality standards.

Whilst the system has appeal in many quarters, and the user interface has been attractively designed, the problem which this journal faces is that there is user resistance to supplying articles. Originally slated for launch in April 1992, its launch date was postponed until July and in the early months of its availability it has only been able to attract seven articles for publication. The difficulty is that researchers are not convinced that an article published on the 'networks' conveys the same quality image and respectability as that given to a printed refereed journal. Attempts to link publications from OJCCT to *The Lancet* has been one recent way to project esteem for OJCCT authors.

Nevertheless, this resistance by authors to electronic journals is not a new phenomenon. It was the bane of Professor John Senders' first electronic journal through the EIES project at Princeton in 1976-1978. Similar problems existed in getting authors to contribute to the BLR&DD electronic journal projects in the 1980s - BLEND and QUARTET. The technical problems are sidelined in favour of the more serious - and less researched - areas of user behaviour and researcher needs. To quote a 1986 report from two researchers at Hewlett-Packard introducing computer conferencing within the organisation: 'Apart from the initial access hurdles we experienced, the true issues have been personal, sociological and political' (Fanning and Raphael). This is as much true then as it is of EP now. 'Publish or perish' is a maligned and over-used concept, but it focuses on a crucial social dynamic. That is, to be seen to have had the full refereeing process rigorously applied to a journal article and for it to be published in a reputable and esteemed journal, so that the author can then obtain further research funding and promotion on the basis of the results. There is no present evidence or guarantee that such endorsement will come through the electronic publishing system.

Such issues are being addressed through the SEPSU project, where it is intended to gain support from vice chancellors and funding agencies to the electronic journal system. If endorsement comes from this level then the barrier to voluntary support by authors for the networked publication system could well tumble. However, such support from the authorities, if it involves an enforced change over the proprietary rights of the research, may raise more problems than it resolves. So far there is no evidence of any support for such 'copyright migration' from the research community, another example of building information systems without seeking hard data. It is certainly a development which causes concern to commercial publishers.

THE KEY PLAYERS

Scientific book and journal publishers

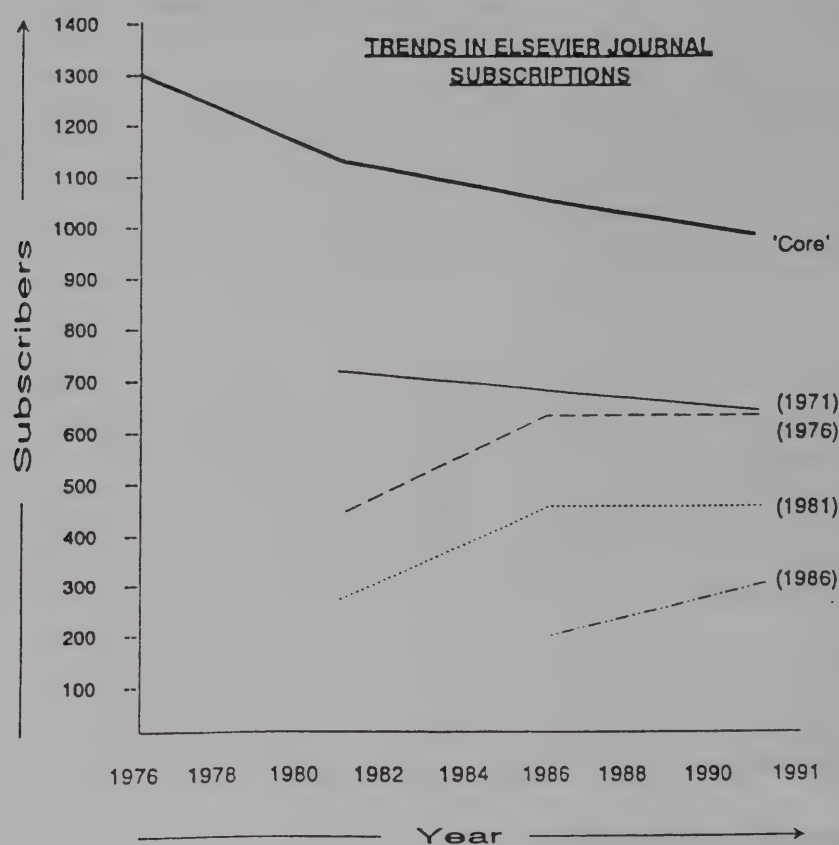
Elsevier Science Publishers

A useful insight into the difficulties facing printed book and journal publishing for the scholarly and research communities can be found in the recent disclosure in the Dutch press of the Elsevier organisation's five year plan. ('Elseviers 'cash cow' naar minder grazige weiden', *Het financiële Dagblad*, Thursday, October 8th, 1992). The report was also picked up in a later issue of the *Wall Street Journal* as the information coincided with a decline of the Elsevier share value.

In essence, the reported Elsevier Science Publishing five year plan commented on the weakness of the traditional 'cash cows' within the Elsevier group - the 20 or so 'core' scientific journals. These are responsible for some 50% of the Elsevier Science turnover, which in itself (in the pre-Elsevier/Reed merger) was responsible for 60% of the Elsevier nv profits.

However, the budget pressures facing libraries has led to a 3% per annum decline in subscriptions. Given the low circulations of specialist scientific journals, such market constriction is leading to a 'dangerous vulnerability'. The following table, reproduced from

figures disclosed by Elsevier staff at the European Serials Conference in Nordwijkerhout (September 1992) illustrates that the problem of declining sales is not just confined to the core journals but also to newly established journals catering for the 'twigging' phenomenon of science not being able to take off.



The leaked Elsevier report also comments on the decline in 100 book titles in 1993 over 1992 in response to the sales difficulties facing this product.

The response to this problem, reported in the article, was that profitability would be maintained through an upward adjustment of unit (per page) pricing. That this will put further pressure on the already 3% per annum projected decline in subscriptions was not commented on.

The decline in the status of the library and its buying power is seen as only one of the problems besetting scientific journal publishers in the future. The changes in user behaviour, with greater emphasis on desk top publishing and electronic mail exchange of data, is breaking into the formal pattern of quality controlled printed publications.

As such, Elsevier has invested in new media systems in recent years, undergoing internal restructuring to provide a focus for these experiments. These have been essentially applied in nature - few publishers invest in basic consumer research such as that undertaken by the Faxon Institute. There is still a solid conviction that no matter what new media systems will emerge

to serve the international scientific community in the future, there will remain a core set of functions which only professionally-managed publishing houses will be able to organise. These will not differ greatly from the quality control services currently being provided though it is agreed the final format of the information may change.

Elsevier dominate in several experiments in looking at the new media horizons. TULIP and ADONIS have already been referred to. The other is a less publicly visible system, but equally significant in the EP order of things.

CAP-CAS

A considerable investment has gone into the design of an in-house electronic production process at Elsevier. The term 'CAP-CAS' has been applied to this. CAP-CAS is an SGML marked up database into which all the article headings from all the 1,100 journal currently being published by the Elsevier and Pergamon offices world-wide will ultimately be fed. Elsevier has modified the generic American Association of Publishers (AAP) guide for SGML to fit with Elsevier's own journal publishing needs. As such the DTD is slightly different from others such as MAJOUR. Nevertheless, Elsevier is not proprietary about its DTD and has offered to make it available to other publishers.

CAP-CAS stands for Computer Aided Production, leading to Current Awareness Services. The output of the headings file can therefore be made available to a range of new information services which are providing 'alerting' services to their clientele. These include the CAS-IAS services (see earlier) which are being established by all the main subscription agents (Faxon, Swets, BH Blackwell), by the bibliographic utilities (OCLC, PICA), and by library automation suppliers in due course. It is also available to individual university campuses to include within their local area networks. Note how CAP-CAS leads to CAS-IAS, with both systems sharing the common element of having a current awareness system (CAS).

A further stage in CAP-CAS development is not only to take the article headers but to include the fulltext of the articles in a database. This is a longer term development programme, which in view of the extra costs associated with tagging items in the text, and the sheer amount of material published by the Elsevier Science Publishing group, has substantial investment implications.

Springer-Verlag

Another key European player is Springer-Verlag. In the league of scientific journal publishing it comes second to Elsevier/Pergamon - though there is a large gap between the two. Elsevier publish 1,100 journal titles; Springer 290.

The image which Springer confers is that of a solid, reliable if unadventurous traditional publisher. As such its involvement in new media has been muted. Where there have been exciting projects, such as Beilsteins' online and CD-ROM databases, these have been driven by outside organisations which Springer serves (the Beilstein Institute) rather than from Springer

itself. However, within the past year Springer has appointed a director of Corporate Development to spearhead new media activities.

Springer is also developing a CAP-CAS system of its own, and will be able to deliver abstracts and bibliographic information before publication. Springer has produced a textbook for machine engineering students using SGML, which drives not only the printed publication process but also a CD-ROM.

It is in the area of CD-ROM development where Springer has shown the greatest commitment. The *'Handbook of Dangerous Goods'* was their first CD-ROM product some four years ago, and they now have six CD-ROM projects. With Beilstein and Gmelin available as online databases Springer is a significant player in offering chemical information in electronic publishing formats.

Springer is also experimenting with a mailserver on the networks which allows software, newsletters and Springer's catalogue to be downloaded to researchers.

However, in relation to Springer's commitment to the printed publication process, their EP activities remain peripheral.

The Institute of Physics Publishing

IoPP is one of the few UK medium-sized scientific publishers which has committed itself to EP. An appointment of an Electronic Manager was made in early 1992 to co-ordinate a number of existing and new developments in this area. This is a full-time appointment, matched by the necessary resources with which to make changes.

A particularly exciting project is that funded by IoPP and the British Library R&DD, with the support from SCONUL, to establish a new electronic journal in the area of materials science as a complement to a printed journal. It is a case of parallel publishing. The electronic aspects of the programme are being co-ordinated by a project manager based at the University of Loughborough. Professor Jack Meadows is the project director. (See earlier).

At the same time, IoPP has explored with Elseviers the prospects for creating electronic alerting services in the field of condensed matter, capitalising on Elseviers CAP-CAS programme of producing article headers in SGML, and IoPP's TeX based text structuring.

IoPP is also centrally involved in the SPIRS project to provide an electronic journal testbed for SuperJANET. It is one of a dozen publishers which are contributing to a demonstrator project.

Oxford University Press

Having pioneered the Oxford English Dictionary project as a fully electronic publishing system, OUP has through its separate Electronic Publishing Division, been active in a number of CD-ROM projects. It has also signed a recent agreement with the British Computer Society to set up a separate company - Itext Limited - which will publish both organisations' computer

journal flagships and also spearhead a number of other publishing projects which will use electronic publishing techniques (January 1993). OUP has also taken over the management of one of the established 'electronic journals' in the United States.

New information players

If the main scientific publishers fall down on developing electronic media to satisfy a market need, there are several organisations waiting to fill the gap. Most have these have some control over a network, a feature which few scientific publishers have - witness Elsevier's reliance on Engineering Information in order to deliver TULIP through Internet to a few US test sites.

OCLC Inc

With its extensive resources and R&D commitment, OCLC has undertaken research in recent years which provides raw material for the design of new EP products. Its central involvement in the CORE project being run at Cornell University is an instance where it has developed software to facilitate text and chemical compounds to be displayed on the screen in a LAN environment. Other partners in this project include Chemical Abstracts Service and the American Chemical Service, plus Bell-Core.

During the past few years OCLC has been working with the AAAS to develop a network journal, which was finally launched in June 1992. This was a professionally designed service, much-complimented. The service is available through OCLC's network as well as Internet.

Several publishers have contacted OCLC to make the software which underpins the AAAS experiment - *Online Journal of Current Clinical Trials* - to be made available for other publishing projects. Final discussions are being held to allow the software to be used in the UK, with a leading learned society.

Whilst OCLC does not control the information content, it does have a powerful distribution outlet, with over 11,000 libraries using OCLC's online services in the USA. Determining the information which is carried through this network gives OCLC a say in the speed and direction of EP development in the US.

CARL Systems Inc

CARL Systems Inc is a young company set up in 1988 to market the range of bibliographic services which the Colorado Alliance for Research Libraries (a not-for-profit organisation) has created over the past 2-3 decades. Several hundred databases are available on the CARL network which now links over two hundred libraries across the USA. UnCover is only one of these databases; several OPACs, a number of full text bibliographic databases, local datasets and various library management systems are all available through CARL.

The marketing arm - CARL Systems Inc - is proud of its reputation of being a maverick in the information business. It has a heuristic corporate policy of 'ready..fire..aim!' which have brought it many supporters but equally many critics from the old school of librarianship where bibliographic control standards are paramount. Its entrepreneurship gives the potential for providing a lead in the provision of an electronic/networked information system; its weakness has been insufficient financial resources to do everything which the management team of three wanted to do.

A new joint venture is being formalised between Blackwells Ltd and CARL Systems Inc to create an autonomous company, based in Denver, which will enable the menu of wishes to be fulfilled. Blackwells will provide access to the required financial and marketing resources. The agreement should be signed in January 1993.

Other organisations and partnerships

Many other organisations may still emerge capable of providing value-added services in support of EP. Network providers would seem important on this list, and BT's contract to develop the SuperJANET optical fibre linkages brings it into the realm of interested parties for scientific communication. Discussions between a national carrier and a large information centre in the UK are at an early stage. Many more unconventional alliances could also develop as it becomes apparent that the amount of data transmission which an effective scientific information system demands will bring new opportunities to hardware and software companies.

OVERVIEW AND CONCLUSIONS

Migration from printed to online

The above indicates the hesitancy which many scientific publishers have in committing themselves to EP. There is a suspicion that the fragmented and small-scale nature of the industry is a significant factor in generating a parochial view.

There is nonetheless an awareness that the market is changing. That electronic document delivery will eat into journal subscriptions, and that the very role of the publisher will be challenged by the emergence of academic-initiated and supported network publishing ventures. The printed book and journal revenue base could be threatened.

A 'revenue gap' could arise. The decline in journal subscriptions of about 3% per annum could lead to a fall through the breakeven barrier of all but the core (or 'lifeline') journals. The challenge to the UK publishing industry is to fill this revenue gap through income derived from EP products, so that when a large share of the publications are demanded in electronic format the existing publishers are there ready and able to meet the demand. There has therefore to be a period of cross subsidisation, with the traditional products supporting the new EP projects. The more intense the decline in the journal sales, the greater the emphasis on new electronic information systems to provide the stable revenue stream.

A worry is that many of the more cautious publishers are battenning down the hatches on the printed systems, looking for more and more cost savings to keep profitability levels up, without any systematic commitment to the new EP systems. All but a few of the larger publishers are in this position.

Pundits have forecast the demise of printed publications in the past, and these cautious publishers take comfort from the fact that these forecasts have been wrong. What is to prevent the forecasts of increasing EP penetration being equally wrong, particularly if one represents a small publisher without the resources to monitor and explore the EP trends?

Scientific information as a 'Free Good'

Complaints come from the academic and library communities that publishers are exploiting academia by taking the research results (generated at great national and local cost) largely for nothing, having the quality control exerted through the use of referees who provide their services free, only to sell the same information back to the library and research community at an inflated price.

This has led to the feeling that information should be 'free'. Whilst some commercial return may be acceptable, it should not generate the sort of profits enjoyed by the larger commercial publishers and societies - the £100 million per annum operating profit coming from the scientific activities of Reed Elsevier, for example.

This is a sore in the side of publisher and library relations. Until it is cauterised both sides need to recognise the skills and contributions which each side brings to the function of scientific information dissemination.

'Copyright migration'

The most visible instance of where relations are at breaking point concerns the interpretation of copyright and how it should be applied to scholarly/scientific information.

Should control over the allocation of intellectual ownership be vested with the funding authority or institution within which the research is carried out, this could have unforeseen consequences on the delicate structure of the dissemination of research results. The implications of artificial distortions to what is currently accepted by the research community as a tolerable mechanism needs to be investigated before major changes are pushed through. At risk is the very lifeblood of research; there are more issues at stake than the profit level of a small number of commercial publishers.

The need for more information

Repeated many times in this overview is the claim that there is insufficient information available on which to make decisions about the way the publishing industry can be brought

into the 1990s. It is suggested that an in-depth study be made to look at the infrastructure and commercial problems which are unique to scientific publishing. If undertaken in an impartial way, with contributions from both publishing, librarianship and policy making on the steering committee, it would provide the material on which to make proposals for the future.

For example, a questionnaire could be sent to all the key STM European publishers, particularly those based in the UK, to find out how they have changed their internal management to allow for external market information be used internally, and what ambitions they have in EP.

An assessment of the costs of traditional publishing could be undertaken, with a particular view of establishing the real 'entry costs' to the various new technologies. This would provide an insight into the comparative economies of scale between print and electronic systems - whether the main body of UK scientific publishing has the physical potential to migrate from printed to electronic publishing systems.

REFERENCES

1. DJB Associates. *The Academic Publishing Environment*. BL Research Paper 84, 1990.
2. Harry East. *Balancing the Books - Resourcing Electronic Information Services in Academic and Public Libraries*. CCIS Paper No. 3/BLR&DD Report 6057.
3. David Worlock and David Brown. *Network Publishing - A Multiclient Study*. Electronic Publishing Services Ltd, December 1992.
4. *The CD-ROM Directory - 1993*. TFPL Publishing, December 1992.
5. Peter J. Curwen. *The UK Publishing Industry*. Oxford: Pergamon Press, 1981.
6. CEST. *Information Flows into Industrial Research*. Centre for Exploitation of Science and Technology, November 1989.
7. Faxon Institute for Advanced Studies in Scholarly and Scientific Communications. *An Examination of Work-Related Information Acquisition and Usage Among Scientific, Technical and Medical Fields*. Westwood: The Faxon Institute, April 1991.
8. Tony Feldman. *The Emergence of the Electronic Book*. BNB Research Fund Report 46, 1990.
9. Tony Feldman. *Further Developments of the Electronic Book*. BNB Research Fund 57, 1991.

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SuperJANET project on information resources: a study commissioned by the JNT

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Overview

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¹ Study Director. This is an edited version of the full report presented to the JNT.

Resource discovery and description

A new role for the publisher?

The British Library

References

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Executive summary

1. SuperJANET provides the opportunity for both the improvement of existing library and information services and the development of new multimedia information services. The network will enable widespread resource sharing between libraries, through the creation of 'national' databases accessible over SuperJANET.

2. The present system of scholarly communication is under severe strain, as libraries fail to keep pace with the rapid growth in publications. At the same time, are a number of national initiatives which recognise the importance of networked information resources. It is therefore an appropriate time to discuss the new information services that SuperJANET enables.

3. The opportunities for new library and information services fall into four broad groups:

- (i) **document delivery** of the full text of journal articles and associated images is likely to be the major initial application of SuperJANET for library and information services;
- (ii) SuperJANET will lead to the development of **new publishing opportunities** and the creation of new multimedia publications which allow the manipulation of the information by the user;
- (iii) improved **access to collections** of rare books, manuscripts, maps and archives, pictures, sound recordings and moving images;
- (iv) libraries will have a central role in supporting and delivering **multimedia courseware** and organising the provision of supporting multimedia information resources.

4. Librarians have been enthusiastic and effective users of JANET, both to assist in the operation of their libraries and to provide services to users. The involvement of librarians and the application of their skills as information intermediaries has provided an effective stimulus to networked information services and has led to a rapid growth in the use of JANET. The provision of innovative library and information services over SuperJANET, initially mediated and delivered by the library and information community, will have an equal stimulus to the take-up of SuperJANET by the academic and research community.

5. In order to achieve the effective use of SuperJANET information resources it will be necessary to address a wide range of economic, legal, political and social challenges must be addressed:

- (i) there is a need for a **forum** for the discussion of networking information issues, which also has the power to implement decisions in the interest of the academic and research community;

- (ii) the issue of **copyright** and the creation of economic models for the use of networked information resources must be discussed at national level;
- (iii) as the range of organisations joining the network increases, a clear **funding and policy** framework must be established, in order to make the network more open;
- (iv) there must be **training** in the access and use of SuperJANET information resources and **awareness** of the existence of the network and its services;
- (v) an **institutional infrastructure** which addresses the technological, organisational and cultural issues will be necessary to take full advantage of the information resources on SuperJANET;
- (vi) **protocol and format standards** are central to the development of effective SuperJANET information resources;
- (vii) to enable the effective use of network information resources, **access tools** and **resource guides** will have to be developed;
- (viii) **publishers** will develop new roles to manage and deliver networked information resources;
- (ix) the potential of the **British Library** as a provider of valuable information resources, and as a central player in the development of future networked information services, should be recognised and encouraged;

6. Even without the guarantee of any funding for SuperJANET information pilots, a wide range of individuals and groups have brought forward ideas for potential projects to illustrate the capabilities of the network. If the investment in the SuperJANET technology is to be fully realised, it is vital that a range of library and information 'demonstrator' projects are funded to stimulate the community and inform institutions. There is also a need to educate the market and to find, what has been termed, the 'killer' SuperJANET application for library and information services. It is equally important that the pilots are integrated and move the academic and research community towards the creation and use of the 'virtual library'.

Introduction

Networking is one of the most important issues currently facing the library and information community. The convergence of computing and communications technology is affecting the creation and management of information in ways not witnessed since the introduction of printing with moveable type. (1)

This Study was commissioned by the Joint Network Team (JNT) to:

- (i) identify the strategic issues for the provision of SuperJANET library and information services
- (ii) raise the consciousness of the library and information community and to encourage the wider discussion of the implications of SuperJANET
- (iii) identify potential and actual pilot projects and allow interested groups to stake a claim of interest in SuperJANET library and information applications.

Note: In this Report the term 'library and information services' is used to refer collectively to the wide range of information and network user support services in an institution, whether

provided from the library or the computer centre or from a combined academic information service. The term 'networking' is used to refer to the network connectivity services available to the community and to the information services, communication and cooperative arrangements they enable.

The Study outlines some of the significant changes to the UK higher education environment that are taking place and which are having an impact on the library and information community, as they continue to meet the information needs of both staff and students; it also details a number of relevant centrally-funded initiatives which will have a significant impact on the use of networks.

A number of SuperJANET library and information scenarios are outlined to provide a flavour of the type of services that could be developed with SuperJANET.

The Study Group explores the opportunities for new library and information services that could be provided over SuperJANET and these services fall into the following broad areas:

- Document Delivery
- New Publishing Opportunities
- Access to Collections
- Multimedia Courseware

Libraries already make extensive use of JANET, both to assist their operations and to provide services to their users; the current uses of the network are outlined. It can be assumed that libraries will be equally enthusiastic and innovative users of SuperJANET.

The potential SuperJANET services raise new challenges, and while the technical issues will need resolving, the more difficult issues may well be the social, economic, political, and legal ones. The issues will need to be addressed and resolved if the full potential of SuperJANET as an 'Information Superhighway' is to be realised.

The membership of the Study Group is given in *Appendix 1*, and a list of items referred to in the report is also attached.

Environment

Structural changes in higher education

The higher education sector is undergoing a number of important changes which include:

- rapid expansion in the number of students;
- restructuring of course delivery and degree paths. There are moves to shorter degrees, modularisation of courses, standard learning packages, credit transfer and student mobility, franchising arrangements, and off-campus learning;
- unification of higher education system;
- national fragmentation of funding for higher education;
- research selectivity and end of dual-funding system.

A shift in emphasis from teaching to learning and the present need to provide effective support for research across the whole of higher education are putting increased demands on library and information services, and prompting re-examination of existing patterns of resource sharing, information delivery and use. There is a need to recognise the particular problems currently faced by the 'new' university sector which is, in general, technologically far behind the established university sector and often lacks the necessary technical and support infrastructure. The lack of residential facilities and the lack of space on campus, means that any networked information services will also need to be accessible via dial-up lines.

National initiatives

Access to networked information resources and communications will be a major network application of the future. Networked resources are critical to the entire higher education and research sector and widespread access to significant resources will be fundamental to the success of SuperJANET. At the same time the volume and variety of electronic information products and services, and the range of user requirements, are growing.

Several national programmes already recognise the importance of information services:

- **Computers in Teaching Initiative (CTI)**
This UFC-funded project was set up in 1988 and is now supporting twenty discipline-based centres, with each centre providing information, advice, training and support for academic staff wishing to develop and use computer-based programs in teaching.
- **The Teaching and Learning Technology Programme (TLTP)**
This initiative aims to make teaching and learning more productive and efficient by harnessing modern technology. It is currently focused on the development of courseware and has funded 43 subject-based projects. The next round of the programme should encompass infrastructure, support, and implementation issues, by looking at the delivery of course material.
- **The Information Technology Training Initiative (ITTI)**
This aims to develop and improve the availability of training materials and products for use by University Computer Centres, but future developments in this area should aim to expand the projects to other intermediaries on campus, such as librarians.
- **The ISC Datasets Policy**
If this is adopted by the HEFCs and the JISC, it will result in the creation of several data centres providing access to a variety of datasets, including full text. This will support research needs, but also aims to create a mass market for datasets for undergraduate use.
- **The HEFC Libraries Review**
The Review's aims are to investigate the future national needs for the development

of library and information resources, including operational and study space requirements, for teaching and research in higher education institutions; and to identify ways to meet these needs taking into account:-

- the planned expansion of higher education;
 - the current and potential impact of information technology in information provision; and
 - the possibilities of greater cooperation and sharing of capital and recurrent resources.
- **The Libraries Initiative**
This JISC initiative, likely to be £3m per year over three years beginning in 1993, aims to help meet the needs of a mass teaching system and to facilitate resource sharing without creating new research libraries.

It is too early to say what the impact of these programmes will be, but they have the potential to create significant additional use of the network, and to develop applications which will benefit from SuperJANET.

Existing library provision

Library support of learning and research has been badly hit by falling budgets and rising journal costs. Between 1978 and 1990 expenditure on books per student in the 'old' universities fell by 30% in real terms. On average one and a half books per student were bought. In the same period, expenditure on journals fell by 36%. The situation is worse in the 'new' universities, where average expenditure on books per student fell by 56% in the same period. Average annual expenditure on books per student was £23 in real terms (the average price of a textbook was £26 in the same period). Expenditure on journals fell by 51% (3). This situation reduces provision at a time of increased demand for both teaching and research. More text books and basic journals are required to support teaching, and the volume of journal titles continues to rise, fuelled by subject specialisation and academic pressures to publish. The above report cites British Library research findings that 20% of researchers said journals essential to their research had been cancelled; 39% said that their libraries were not subscribing to new journals.

In a wider context, libraries cannot continue to expand indefinitely, paying for binding, storing and maintaining what is generally recognised to be an under-utilised stock. Publishers are faced with falling subscriptions as libraries cut back and as resource sharing grows. The current pattern of supply is therefore not ideal for either publishers or libraries and the present system of scholarly communication is under severe strain. It is therefore an appropriate time to discuss the new publishing opportunities that the advent of high speed offers and to explore different ways of delivering course and research materials.

SuperJANET scenarios

JANET is already facilitating a shift in emphasis away from local ownership of resources towards the use of dispersed resources. New strategies for service provision are being explored

A 19TH CENTURY HUMANITIES RESEARCHER

A researcher wishing to trace material on a Victorian public figure normally would expect to spend hours sifting through a wide range of printed biographical sources. An element of lateral thinking is required and this would take the researcher from secondary works to primary sources in the form of contemporary periodicals. Once the scholar has established the basic biographical information necessary to assist in recovering documents about their subject, the next stage would be to consider where such documents may be held. This might involve a visit to the Historical Manuscripts Commission to consult the NRA. A visit to the PRO may be called for, to retrieve public documents created or received by the individual, and there may also be papers in private hands, which never find their way into the historian's lap, but simply gather dust in some attic.

With SuperJANET the researcher could have access to a rich resource of inter-disciplinary multimedia source material. All key biographical dictionaries, only now available in printed form, could be available on-line and no longer would students have to be told that this or that important reference dictionary cannot be borrowed, or is too fragile to photocopy, or the binding obscures the text at the margins. In a moment the researcher will be able to download the biographical details and any portraits needed to her workstation. The NRA could be accessed, as would the full text of lists and catalogues of manuscript collections. If some of the major archive collections were scanned and digitised, so that high quality facsimiles could be retrieved at high speed over the network, the 19th century researcher would be able to retrieve material from archives, without originals, reduce travel costs, save time, and would be provided with near-originals for detailed perusal. This ability to retrieve manuscript sources need not be restricted to full text documents, but high quality visual material, such as portraits, from one of the major art galleries, or from photographic collections, or a piece of ephemera, could equally easily be accessed.

Unwieldy and fragile newspapers could be transmitted to a researcher's desk, and this underutilised material could be fully exploited. Not only would national newspapers be available from the BL's vast holdings, but the rich resource of local newspapers held throughout the country in many public libraries, could also be accessible. The Morning Herald and Daily News would compete on equal terms with the Hampshire Telegraph or Sheffield Iris. The Windsor Photographic Collection, the Radio Times Hulton Picture Library or a picture from the Illustrated London News, could be delivered over SuperJANET, providing the highest quality pictures. Sound and motion could be retrieved : war reports, Pathe news coverage, Hollywood, television, radio, video.

A JOURNEY THROUGH THE BRITISH LIBRARY

Brian accesses the BL Gateway from his workstation and on connection, the Gateway carries out its functions of identification, authentication, and authorisation and establishes Brian's status. The Gateway presents Brian with a menu of services and he is interested in researching into Winston Churchill. As a first step, he connects to the OPAC, undertaking a series of searches on a subject basis, for some particular works which he knows to be relevant. Brian decides that the complete bibliography retrieved by the various searches is of permanent use and asks for the references to be duplicated, sorted into author order and emailed to him.

One of the references looks very interesting and he sees that the full text of the item is available for display. He negotiates with the system and asks it to display the contents page and the illustrations, the jacket blurb and the first page of each chapter. He decides that chapter 7 contains important new information, and asks the system to display the full chapter. He reads the chapter and asks the system to deliver a file containing the item's reference, the contents page and the selected chapter, together with some of the colour illustrations to his mailbox. He then decides to search the ETOC for recent periodical literature on the topic; 25 articles are identified - 6 are in the DSC image store and can be displayed immediately, the others will be scanned and delivered within two hours. He is advised of the cost of delivery of the page images to his workstation, confirms his acceptance of the charge, decides to request 8 of the 25 articles, including 5 which are available immediately. Brian searches ENI, which indexes the holdings of the Newspaper Library, to identify articles in British newspapers on the topic of interest. He identifies some current articles which are in the image store and these are browsed. Based on information in one of the articles, he decides to repeat the search on issues of 25 years before. The material of interest found there is only held on microform; he negotiates with the system about charges, accepts them, and requests the relevant microform pages to be scanned.

The Gateway knows that Brian's workstation can support sound receipt and playback and therefore suggests that relevant speeches of Winston Churchill may be found in the NSA collections. Brian searches the catalogue, and finds material in the current affairs programmes in the BBC radio programmes archive, and selected material is played back to his terminal.

in a SuperJANET environment where services, now only possible over a LAN (local area network), will be possible over a WAN (wide area network). As the potential uses of JANET could only be imagined by the network planners ten years ago, so it is now only possible to speculate about how the academic and research community will use SuperJANET to create new networked information resources and services. SuperJANET invites us to consider a world of higher education organised around the movement of information (4).

A SUPERJANET REFERENCE LIBRARIAN

From his networked, windowing workstation, the SuperJANET Reference Librarian opens one window onto electronic mail; another onto a sophisticated resource discovery tool, capable of matching specific queries to resources; a third provides access to locally held material; and yet another window is logged on to a permanent, ongoing electronic reference librarians conference.

Firstly, the increase in users with a networked PC on their desk will result in the use of email as the query method of choice. Why should the user have to leave the office to ask a question? Many queries will be quickly answered by using the resource discovery tools available and with these it will become possible to enter the author or title of a book, and rapidly search ALL library OPACs for a location and look at its contents page. More importantly, however, whereas today's reference librarian might only be able to offer a potential source in which the user might find the answer, the SuperJANET librarian will be in a position to answer specific queries directly. This might include providing facts, figures and dates from online data, but much more interesting will be the ability to provide answers to questions which may have been unanswerable before - are there any photographs available on a particular historical occasion? With suitable resource discovery tools, it will be possible to select and search appropriate resources and order the required image to be delivered to the enquirer's workstation.

Of course, many of the resources available to the SuperJANET reference librarian will be equally available to end-users, and many will be able to answer most of their queries themselves. Thus the reference librarian becomes free to tackle the less routine questions, or to spend a greater amount of time helping novices in the information world, using computer-based learning tools which will help the user help himself. Many queries received at the reference desk are due to the user having an inadequate knowledge of how to use a particular resource. Unfortunately, the librarian seldom has the time to teach the user how to use the resource, hence having answered a particular query once, it is likely to recur in another context. By making appropriate learning tools available at the user's workstation this can be avoided. Finally, should the wealth of resources at the librarian's fingertips fail to answer the query, the ultimate recourse might be to a standing electronic conference of reference librarians. Thus the user's query can be presented to the combined expertise of the entire academic library community in about the same time as it takes today's reference librarian to direct a user to the toilets.

In this new environment some trends are:

Growth in resource sharing: The need to support research activity across the new unified higher education systems, without significant additional investment, has made the development

of cost-effective resource sharing strategies a priority. The HEFC Libraries Review is considering how technology can be used to facilitate the exploitation of existing collections by making them more widely accessible over the network.

Improved access to specialist resources: There are numerous potential network resources which are under-utilised or little known, because no effective means exists to exploit them.

Cooperative and shared access: The success of the BIDS initiative will make this pattern of provision much more common, though the funding model may change. Datasets proposed for acquisition under the ISC Datasets Policy are likely to cover a wide range, from bibliographic files to astronomic radio signals. Many of these databases are character-based, but SuperJANET will encourage the development of image-based resources.

DOCUMENT DELIVERY

Hillary logs into the campus information system. She selects a general articles file for searching (actually the British Library's article contents file mounted on BIDS, but she does not need to be aware of this). She does a search on the role of wives of the president in US politics. There are ten hits. Four are highlighted: they are in the local collection. None of these looks interesting. She selects to look at three of the others. An image of the front page, which usefully has photographs is presented for each. Two of the articles look interesting and she flags them for delivery. A variety of delivery options based on cost and speed is offered; she elects for immediate delivery of both articles. She is offered several payment options. She is authorised to charge the service to a departmental account, but she chooses to pay by credit card and enters the number. In a couple of moments she is informed that the documents have been queued for dispatch to the campus document server (the documents were actually stored on optical disk in the BLDSC).

Other products: It will be increasingly common to mount some categories of material - reference works, abstracting and indexing databases, electronic journals, image databases, computer simulations - as network resources. Both researchers and students already use a wider range of network resources beyond bibliographic resources and text: geographic information systems, census and other survey data, and other numerical, factual and scientific databases. In many disciplines these are more important than, or will come to be more important than, existing bibliographic services and with the moves towards independent study, students are now making an increasing use of 'research' materials. These requirements will be met by a range of products and services which exploit SuperJANET and which are produced not only by the institutions themselves but also by government, industry, research and commercial suppliers. The British Library-sponsored report *Information UK 2000* suggested

that the number of producers and distributors of data will grow considerably. One sign of major change in the USA is the GPO-WINDO proposal of the US Government Printing Office to turn itself into a major multimedia publisher. Most existing resources are character- and terminal-based. However, there will be increasing use of client-server models, highly interactive multimedia services and routine delivery of large amounts of data to a greater mass of the community.

Opportunities for new services

The growth of data communication networks, especially the academic research networks, throughout Europe is now empowering individuals and libraries with previously undreamed of access to information. (3)

Document delivery

The major initial impact of SuperJANET on libraries and their users will be in the area of document delivery, in taking an image and transferring it from one place to another. SuperJANET will enable users to obtain the full text of journal articles in page image format, together with associated images either directly to their workstations or via the library. As more libraries move towards an access rather than a holdings strategy, ready access to journal articles will be central to the success of such a strategy. Services in other countries have shown that it is possible to deliver documents either by file transfer or within electronic mail messages as scanned images, and a number of groups in the community are investigating the electronic delivery of full text of journal articles. However, there are no substantial electronic delivery projects underway in the UK. The technological problems, such as scanning technologies, storage, ILL and associated protocols, may be solved relatively easily, but a number of wider organisational, institutional and service issues, such as workstation and printer access, delivery directly to end user or via the library and charging and billing mechanisms will have to be resolved before a successful electronic service for image-based document delivery can be provided.

One of the major obstacles to be overcome is that of copyright, but preliminary discussions with publishers have shown that this may be solved if monitoring and charging for electronic documents is reliable and there is revenue for publishers for value-added services. Copyright is an international issue. Developing document delivery services, such as RAPDOC in the Netherlands, which plans to provide a scanned journal article delivery service to its member libraries, is already negotiating agreements with publishers. Such agreements could have worldwide significance and there is a need for the UK academic and research community to monitor the outcome of these discussions and to enter into discussions with publishers in the UK. The issue of copyright is discussed more fully below.

The provision of rapid image-based document delivery services will have a significant impact on the development of resource sharing between libraries. If the journal article and the associated images can be rapidly delivered to workstations, the location of the original ceases to matter to the user. An effective electronic image-based document delivery service could provide users with ready access to resources well beyond those available in their own library.

Ultimately, efficient automated document delivery services will rely on the interaction of search, location, request, charging and transmission capabilities. Full integration and interoperability between different systems will be complex and will depend on agreed protocols and format standards, as well as requiring new links between service organisations. Libraries and end users will also need guidance on the most cost-effective route to obtain a document, whether it is from local holdings, or from another institution, from the BLDSO or from a commercial supplier in the UK or abroad. Until a seamless discovery and delivery service is in place, that improves on the traditional library model by providing, for example, the ability of users to browse electronically, many users will be resistant to abandoning their existing patterns of information access and delivery. User reaction to existing electronic document delivery services, in both the Europe and the US, indicates that users' strong preference is for the delivery of the document image to their workstation. Fax services, such as ARIEL and FOUORE in France, have not been popular as they merely provide a paper copy more speedily and possibly more expensively.

Recommendation 1 : There should be further evaluation and piloting of several different document delivery solutions, further work in the standards area, in ways of storing the data, in delivery and charging mechanisms, and in the provision of means for the user to view/access the scanned image on screen or printer. This work should build on the experience of document delivery projects in Europe and the USA. (ACN)

Recommendation 2 : The different activities and projects in the area of document delivery should be coordinated with a view to establishing interworking between the different solutions. (ACN)

New publishing opportunities

One view that is often encountered is that 'all the technical problems of electronic publishing have been solved, but publishers have not taken advantage of them'. For many academic publishers, technical limitations in networking have been sufficiently large that electronic publication is not viable, but SuperJANET offers new opportunities for which they have been waiting. These opportunities involve the provision of colour and high resolution images, linking multimedia data, at present separated into different cost-effective distribution channels, and manipulability of material.

- (i) Academic publications offer a large variety of images in addition to text, including colour, half-tones and high resolution line drawings (up to 1200 dpi). It is currently believed by publishers, as guided by their editorial boards, that institutional and individual subscribers would not be satisfied with a decrease in the quality and range of these images in communicating and illustrating ideas. SuperJANET's greater bandwidth offers a great functionality for distributing the large file stores associated with such images in real-time, which have not been able to be explored on JANET before now.
- (ii) The second main opportunity lies in linking publications with supporting services, particularly electronic information, now only available in separate forms. Current limitations are caused by the number of pages being kept down in order to keep

costs low, which means that there is no space for large amounts of data, or because the printed medium does not permit joint distribution of the material in convenient form. One major example is large datasets, forming supporting material for journal articles. Some publishers make these available on demand on floppy disk, or store them in an available form on an Internet filestore. A second example is found in the offer of associated videos with journals, *e.g.* Astrophysical Journal. Real-time display of digitised videos and access to data makes the integration of data possible. Access to academic journals could then be integrated with supporting material to form new multimedia publications.

- (iii) The third opportunity lies in network support for flexibly interacting with published material. Sending text and displaying images of the printed page is already in widespread development and increasing use. By flexible interactivity, we mean using the elements of a publication other than by reading, looking or listening to them. For example, one might zoom into an image to have a closer inspection, do a harmonic analysis of sound to compare it with another, put numbers into a mathematical formula to test how it works, run a simulation program, or rotate 3D images to view from a number of angles, as done in models of chemical compounds. Such interactivity requires high speed networks and seamless access to relevant software programs and data which may be distributed throughout the UK and the world. To avoid inflexible systems will require cooperation and collaboration between relevant stakeholders in a number of innovative experiments. The large amounts of information handled by publishers has worried them in considering the use of networks for distribution. Whereas small mainly textual experiments have proved possible, publishers have huge data transfer requirements. SuperJANET offers the opportunity for meeting the scale of current publishing activity.
- (iv) Finally, publishers form part of the research and communication cycle and administer a wide variety of functions for academic and industrial research communities. Publication in printed form of monographs, conference proceedings, journals and magazines, is only part of the spectrum which also includes, depending on discipline, book reviews, conference listings, current awareness services, supporting the growth of new areas of research, letters in academic debate, and job opportunities. Like the earlier BLEND programme, supported by the UK government, programmes on SuperJANET offer the possibility of creating new contributions and forms of communication for the benefit of the research community.

Recommendation 3 : A large-scale Electronic Journal pilot, which takes advantage of the power of SuperJANET to deliver colour, high resolution images and multimedia data to create a new model of a journal, should be undertaken. (ACN)

Access to collections

A wealth of information resources are held by libraries, information centres, archives, museums and art galleries and which remain underexploited, uncatalogued or possibly

unknown. These resources are located both within and beyond the academic and research community and there may be little local demand for such material until it is integrated with other collections as part of a national resource. There appears to be considerable scope, not only for the exploitation of often unique resources located in national repositories, public libraries and archive centres, but also for the exploitation of resources located in the commercial world or in private hands. All could be tapped to make a reality of a networked information environment, removing the artificial barriers created by collection development concerned with format, location, or subject. SuperJANET could provide users with the freedom and flexibility to use a range of multimedia resources interactively. In addition, the learning and research process will be enhanced by the ability of individuals to draw upon the expertise of others, communicating with them over SuperJANET. The eventual pervasiveness of the network offers the potential to unlock vast storehouses of information and provide greater access to collections than previously, for the benefit of the academic and research community. SuperJANET offers an opportunity for the sharing of valuable resources, be they in the shape of illuminated manuscripts, rare books, ephemera, museum objects, photographic and slide collections, fragments, paintings, moving images, or sound archives.

For example, a Hebrew scholar wishing to carry out research on Genizah fragments would need to visit a number of places to study such material. In this country there are known to be two important collections; one at the John Rylands Research Institute at Manchester University, and the other at Cambridge University. Outside the United Kingdom the scholar may need to pursue this interest in New York or Jerusalem. How might SuperJANET transform the nature of this kind of research? It is feasible to provide real-time access to disparate collections by utilising advanced visualisation techniques. High quality images of Genizah fragments could be transmitted to scholars at different locations simultaneously, thereby providing immediate conferencing and collaborative research possibilities. There are some fifty thousand Genizah fragments in the Manchester and Cambridge Collections and making the images of the fragments viewable via SuperJANET would allow immediate comparisons to be made between the fragments of the two collections, and ultimately, with fragments located elsewhere. Scholars would be able to establish 'nearest fit' relationships between fragments, by utilising the capabilities of enhanced pattern recognition techniques, thus adding a new dimension to their research. Images of the fragments could be manipulated, so that similar images (and therefore fragments) could be drawn together to create the image of a complete manuscript. Such techniques could be used for dating or date verification, or for determining the provenance of illuminations and illustrations. Handling of rare manuscripts in this way would normally not be encouraged, or even possible, owing to the need for preservation, but SuperJANET would allow close examination without any physical contact.

The collections of national museums represent a particularly rich yet under-utilised resource. The Natural History Museum is especially well endowed. Its Cook Collection comprises water-colour drawings, engravings, manuscripts, and plant and animal specimens made by Sydney Parkinson, Joseph Banks and Daniel Solander on James Cook's voyage around the world in the Endeavour (1768-1771). Relatively little use of the collection is made currently, owing to problems relating to the safety and preservation of such priceless resources. Digitising some of this unique material would allow far better exploitation than is possible at present and there is, for example, complementary material held at the National Maritime Museum which could be brought in electronically to support this collection. The possibilities are endless in

terms of adding value to collections via SuperJANET: bird calls, text and colour illustrations could bring to life the study of natural history.

Not only does SuperJANET offer the potential to provide access to many large and diverse specialist collections in the UK, but it will allow the resources to be presented, viewed and utilised in different ways by a much wider audience/client base. Scholars, teachers and learners from a range of disciplines will be able to use the same resources but from different viewpoints, adding value to the resources. Barriers, created by distance (and diminishing travel budgets), will no longer act as constraints for users in their quest for information and collections hitherto geographically dispersed will be brought together by the creation of 'virtual resources'. It will no longer be important where users are, in relation to resources, or even how many wish to have simultaneous access. The 'bringing together' of resources will encourage a 'bringing together' of expertise, and new partnerships will be created, whereby skilled individuals operating at a distance will be able to share their knowledge, working together as a team.

There will be a need for considerable input to select and put the collections into electronic digital form; attention needs to be focused on standards for storage and compression. Bodies such as the British Academy, British Library, and the Consortium of University Research Libraries (CURL) could advise on the scholarly materials whose conversion would benefit the community, as well as address the technical issues. Such an initiative could involve the CHEST and the Inter-Agency Group on Datasets, and should result in a 'wish-list' of resources valuable to users of the network, together with funding and organisational strategies.

Recommendation 4 : There should be investigations into the range of information resources of potential interest to the academic community, they should be prioritised and a strategy developed for providing networked access to them. (ACN)

Recommendation 5 : The Advisory Committee on Networking should contact the British Library and other research institutions, in the UK and internationally, which are considering digitisation/preservation programs, to explore parallel projects to create network access to converted resources. (ACN)

Recommendation 6 : The Public Libraries Development Incentive Scheme (PLDIS), working with the Public Libraries Networking Advisory Group (PLNAG) should have as one of its primary aims the development of networking strategies for public libraries. (PLDIS)

The area of digitised image transmission has proved to be sensitive, because of fears relating to copyright and security of data for those in the commercial sector. Images appear in a diversity of collections, not just the obvious ones like major national slide or photographic collections mentioned above. Electronic delivery will involve the transmission of digitised images. Special attention needs to focus on this issue to ensure the success of SuperJANET.

Recommendation 7 : A joint study into the copyright implications of accessing and delivering images over SuperJANET should be undertaken with the relevant rights agency. (BLRDD)

Multi-media courseware

Library provision of supporting resources, in a wide range of media will be of vital importance in the construction of successful campus learning environments. (4)

SuperJANET will enable the delivery of learning materials in a range of formats to support both learners and trainers and courseware packages could be made available to students over the network. Learners will be able to choose those elements relevant to their own learning, unconstrained by previous conventions of publishing. The freedom to select a personalised curriculum and supporting material is accompanied by another clear advantage offered by this technology: learners and trainers will no longer be required to be on-site and all modes of learners will have the same opportunities. Part-time and off-campus students will no longer be disadvantaged by the requirement to go to one particular place to obtain learning and support materials and all learners will no longer be restricted to using services at particular times.

However, in order to obtain efficiency gains, initiatives such as CTI and TLTP will encourage moves towards the standardisation of modules and full courses. There will be moves towards the assessment of students between sites and the process of assessment will become increasingly automated. This method of learning will be supported by common textbooks and appropriate networked databases of simulations, images, and other supportive material, together with manipulation tools. It is likely that much initial teaching, in subjects that demand expensive laboratory space, will be based on computer simulations of experiments held in national databases and delivered over SuperJANET. It will therefore be necessary to create and manage databases of images and supporting information resources for access by both students and teachers in a wide range of subjects. One publisher (McGraw-Hill) provides the facilities for the compilation of customised printed course textbooks from their publications, through its PRIMIS service and there is a need to encourage publishers to explore the provision of databases of images and multimedia material on SuperJANET.

Although libraries have not been significantly involved in providing access to and support of such packages, it can be seen as a natural extension of their role in the support of learning based on printed, and more recently, electronic materials. Libraries select printed materials, organise effective access to them, advise on their use, manage their delivery and provide a supportive environment for their use. Libraries are therefore well placed to be one of the areas through which multimedia course packages will be managed and delivered to students and they have the expertise to advise on, collect and provide access to support materials on SuperJANET.

Recommendation 8 : There is a need for projects that investigate the potential role of the library in delivering and supporting multimedia courseware and supporting material. A second phase of the Teaching and Learning Technology Programme should encompass infrastructure, support and implementation issues. (TLTP)

Recommendation 9 : There is a need for projects to build and manage databases of images and supporting materials, with appropriate access and integration tools to support student learning. (TLTP)

Recommendation 10 : There should be an investigation into the networking options for supporting off-campus learning, including SuperJANET, Cable-TV and ISDN. (ACN)

Current use of JANET by libraries

Libraries have been making extensive and growing use of JANET for a number of years (5) and will be well placed to develop innovative services on SuperJANET.

- **OPAC access**
Over 70 UK university OPACs (Online Public Access Catalogues) and many more overseas ones are available over the JANET network and access has been improved by their availability on the NISS Gateway and the development of the SALBIN software, which provides menu-driven access to the catalogues on a PC. Some Campus Wide Information Services (CWISS) and OPACs also provide network access to other catalogues.
- **Access to commercial and numeric databases**
JANET and its gateways are used by libraries to connect to major commercial bibliographic databases and those providing up-to-date social, business and economic data.
- **Transmission of inter-library loan requests**
Requests can be transmitted through the ARTTEL system to the BLDSC over JANET. Guidelines have been developed by the Forum for Interlending (FIL) and the JANET User Group for Libraries (JUGL), for the transmission of requests between libraries over JANET.
- **Access to periodical agents and book suppliers**
Some of the major agents are now connected to JANET, but libraries need to contact directly a wide range of such organisations for the searching of databases, and the transfer of orders, invoices and payments.
- **Access to and transfer of catalogue records**
Through the use of such services as OCLC and the Consortium of University Research Libraries (CURL) database at the University of Manchester, libraries can access and download the catalogue records, as well as to the BNB MARC files, subject to agreement.
- **Access to networked bibliographic databases**
This is available to staff and students at subscribing institutions, to the three ISI Citation Indexes (Science, Social Science and Arts and Humanities) and to ISTP (Index to Scientific and Technical Proceedings); and to EMBASE, through the BIDS service located at the University of Bath. Accesses to the ISI databases now average around 2500 per day, after a relatively constant daily rate of 1500 in the first nine months of 1992; and the highest level recorded has been at 2900 per day. The average access time is 20 minutes. EMBASE begun at around 40

accesses per day and is now at about 160 per day. BIDS will be providing a document ordering service with delivery from the BLDSC in the near future.

- **Professional activity**

Much of which is stimulated by the JANET User Group for Libraries (JUGL):
JUPITER Project: This training project ran from 1988 to 1990, funded by the UGC, and was based at Glasgow University Library. It provided a series of workshops, produced a Guide for Libraries on JANET, a Training Manual and established the Bulletin Board for Libraries (BUBL).

UKOLN : The Office for Library and Information Networking: JUGL proposed to the British Library Research and Development Department (BLRDD) that an office should be set up to develop a strategy for the use of networks by libraries in the UK. UKOLN was established at the University of Bath and is now jointly funded by the BLRDD and the ISC.

Newsletter: A quarterly Newsletter is available to institutional and personal members of JUGL provides information of interest to librarians using the network.

JANET OPAC directory: A directory, *JANET-OPACs : online public access catalogues in the UK*, has been maintained since 1986 by the University of Sussex Library and this directory is also available on a number of Bulletin Boards.

LIS-LISTS: There are a number of active library electronic mail lists based on the Mailbase facility at the University of Newcastle, in particular LIS-ENQUIRIES which is used for surveys and LIS-LINK which is used to inform the library community of networking activities of general interest.

JANET : an overview for Libraries: This provides a brief introduction to JANET and the relevant services available over the network.

Biennial Conference: A two day event to bring together librarians and others interested in the use of networked information resources.

Bulletin Board for Libraries (BUBL): Originally started as part of Project JUPITER, BUBL was taken over in 1991 by a number of volunteers. Usage has expanded from an average of 200 accesses per month eighteen months ago, to over 2400 accesses in November 1992. Funding has since been provided by OCLC, Meckler Publishing, BLRDD and the ISC.

Plan for Library Action on NETworks (PLANET): This is intended to increase and widen the networking expertise in the academic library community and to encourage librarians to play an active role in the exploitation and development of networks and their resources, and to stimulate discussion on the likely role of the librarian in the era of the virtual library. Six work groups have been formed to address the following issues:

- electronic mail and mailing lists
- library automation and networking
- network information services
- e-journals and e-texts
- directories, resource guides and other tools
- education, training and promotion

Challenges

The effective use of SuperJANET information resources and a flourishing culture of network use will depend not merely on the connection of information resources to the network and the solving of the technical issues, but a variety of other challenges must be addressed.

A focus for development

There is currently no forum in the UK for the discussion of networking information issues and for the implementation of decisions, although a number of sectoral interests are represented through different groups. Network providers and user support services, libraries, systems vendors, publishers and other suppliers: these all have their own agendas and forums, different cultures, and often, quite different views of what 'networking' or 'information' are.

Opportunities to influence national policy, to develop shared objectives, to share experience and effort, and to bring together those with ideas and those with the power to implement them are therefore reduced. As the range of organisations connecting to the network becomes wider, there is an increasing need for a focus for consensus building between different interests, for encouraging exemplary projects, for working towards standards and organisational arrangements that will enhance overall service provision and for addressing such broad issues as copyright. A means is required to ensure maximum relevant participation in areas of common interest, while avoiding bureaucracy or unnecessary organisation. Such a body could act as a catalyst for further development of networked services, it could track the various activities currently underway, identify what needs to be done, avoid duplication of effort and therefore wasted resources.

There are a number of available models for such a forum, including the Coalition for Networked Information (CNI) in the US. Attempts are being made by BIC (Book Industry Communication) and some members of the IUCC and SCONUL to establish a forum in the UK, provisionally known as Information Networking Alliance (INA). The proposed Networking Resources Sub-Committee of the Advisory Committee on Networking could fulfil this role, if it is able to represent the wide range of interests, as it will have direct links to the body responsible for UK networking policy and funding.

Recommendation 11 : The Advisory Committee on Networking should consider whether its proposed Networking Resources Sub-Committee could provide a national focus for networked information services. (ACN)

Rights and revenues

It has become clear in our discussions that the issue of copyright is central to the future success of networked information services and economic models need to be developed. Without a well-understood framework for protecting the rights and revenues of information providers, the creation and use of network information will be limited.

The debate over copyright covers two main areas; the interaction between government-funded, government-subsidised and commercial sectors, and the protection of individual rights. Historically, the philosophical societies, later to become the learned societies, published and then set up publishing houses in order to distribute their members' work. Thus authors in return for the services provided by publishers, in particular for arranging wide dissemination of their work, would permit use of their material and relinquish any financial return on its use in order that the learned society publisher could cover the costs of distribution, free copies to Abstracting and Indexing services, and publicity of work at conferences and courses. Later, commercial publishers arose to provide the same kind of services, adopting the same copyright procedures to cover the costs of their value-added services to scholarly communication. University presses, learned society and commercial publishers now publish a similar range of books, monographs, conference proceedings and journals and handle copyright in the same ways, the major difference being where any profit is distributed. Learned societies use it to sponsor and support activities in their communities, university presses to their university and commercial publishing houses to their shareholders.

The current situation in the UK with regard to funding the sectors is as follows. Academics are funded by the Government using tax-payers' money, both for their salaries and for much of their research. Many information services to academics, such as libraries, are similarly funded, others are subsidised, such as the BLDSC and the BIDS service at the University of Bath. The publishing activity is not funded directly from public resources at present and so in return for handling administration, production, advertising and distribution, it needs to levy charges for its services, which are met by individuals and libraries, many of the latter being funded by government. The copyright law currently protects returns for these value-added services. The copyright law, thereby, also protects the interests of academics, which are to make available quickly and efficiently the results of their research work and communicate it to others who would be interested. Any system for meeting these objectives, whether a development of the current publishing systems or any new system, will require appropriate funding in return for services provided. The traditional approach in the UK and other 'western' economies has been for the market to set the level of remuneration for products and services, and monopolistic or government-controlled pricing has often been counter productive.

Publishers ensure that their material is known about through Abstracting and Indexing services, they attend conferences and show the material prospective purchasers and maintain a higher quality of publication in speed, appearance and range of media offered. A copyright fee commensurate with the services offered is charged by the publishers.

The issues of copyright are complex and there needs to be a considered look in light of the new opportunities presented by SuperJANET, studying the interaction between sources of funding, incorporating the political, educational and legal aspects (bearing in mind the prospective EC legislation on information databanks and copyright). Solutions that do not provide rewards for excellence, such as copyright rates controlled by agents external to market forces, may not therefore be appropriate.

Experience with different models is now emerging and academic information services need to begin to plan and budget for stable migration towards electronic services. For many categories of material, academic providers will want to adopt licensing or subscription models, which enable unrestricted use within an agreed community of users. Some publishers may prefer

per-use charging, with some metering mechanism. There will be a considerable period of experiment as libraries and publishers learn how the market will operate.

Note: A report on Electronic Copyright was commissioned from Professor Charles Oppenheim and his view on current issues and problems, together with his recommendations, appears in the full SPIRS report.

Recommendation 12 : The Advisory Committee on Networking should encourage the Department for Education, The Department of National Heritage and the Cabinet Office to consider implementing a major review of copyright in the context of the flow of funds through the academic system of scholarly communication, to include representatives of the government funding agencies, publishers, librarians and lawyers. (ACN)

Recommendation 13 : Pending a more permanent solution for Intellectual Property Rights, the HEFC Libraries Review should investigate a framework for negotiating licensing agreements with publishers. (HEFC Libraries Review)

Recommendation 14 : A set of models and/or achievable agreements on copyright should be compiled. (BLRDD)

Funding and policy

The UFC-funded institutions have already seen some changes now that their previously top sliced funding for computing, which was managed by the Information Systems Committee of the UFC, has been incorporated into their institutional grant. These institutions reaped the benefits of a centrally managed network, they received pump-priming for certain initiatives and additional advice and expertise as a result of the networking programme of the Joint Network Team (JNT). Therefore all institutions within that sector had the ability to provide good network services to their users and they could communicate equally with all the institutions within the sector. In this way 'top-sliced' funding created a community of network users and the Study Group regrets the move away from 'top-sliced' towards charging. With the establishment of the three Higher Education Funding Councils and of the Joint Information Systems Committee (JISC), cooperation and collaboration will be necessary to ensure that adequate funding is available in the future to support national initiatives such as networking, but this is in an environment where institutions see themselves as competing.

Central funding should be provided to bring all higher education and research institutions, initially to 2Mbit/s bandwidth, but to the 10Mbit/s level soon, and to pump-prime in areas which will provide benefits to the whole community, in both services and costs. SuperJANET should see an explosion in the provision of electronic information services, the potential availability of rare resources to all researchers and the ability to collaborate more effectively. However, to ensure this all institutions should be able to participate at an appropriate level of connection. Networked information resources should be seen as an essential component of the network and there is a need to fund an appropriate level of human resources to facilitate the use of the network. It is also important also to ensure that adequate levels of network support and expertise are available in institutions, to allow the user community to gain the maximum benefit from the network.

Recommendation 15 : Basic connectivity at the minimum of 2Mbit/s and then to 10 Mbits/s should be established to all universities. (ACN)

With the gradual removal of 'top-sliced' funding for JANET and the move towards charging institutions for network access, there will be a need to develop easily understood and administratively simple charging mechanisms, both within and between institutions, for network services and resources. It is likely that retailers, or brokers, of network services will emerge to provide a means for the delivery of charged-for services from supplier to end user. Brokers will emerge, for example, in the area of image delivery, storing materials from publishers, providing user interfaces, charging for delivery to users and returning a revenue to the publisher for each item supplied.

The present departmentalised funding of JANET is preventing other library and information services, such as the public libraries, government libraries, national archives, art galleries and museums and health service libraries, from easily taking part in the development of networked information services. The academic and research community would benefit from network access to the OPACs of these libraries and many have resources, such as images and objects which could be made available over SuperJANET. A mechanism for funding network access to these resources, which can be regarded as part of the higher education community, needs to be established.

Recommendation 16 : The Advisory Committee on Networking should contact the bodies responsible for funding the national libraries, art galleries and museums to encourage them to consider funding JANET connections for these institutions, as a cost-effective way of providing access to their resources and of making these resources more accessible to the academic and research community. (ACN)

SuperJANET information service providers should be aware of the potential of the network and there is a need to clarify future funding patterns, Acceptable Use Policies of JANET/SuperJANET and connectivity arrangements. This will assist planning for services. Libraries or suppliers may be reluctant to invest in significant services if they cannot predict network costs, how the national subsidy is distributed, and the size and composition of the market for high-speed applications. There is a need to have a well understood framework to enable commercial service providers to come onto the network.

Recommendation 17 : There should be a programme of seminars and publicity which promote exemplary SuperJANET projects, appropriate standards, identify areas for potential exploitation, introduce potential suppliers to SuperJANET and SuperJANET to potential suppliers. (ACN)

Recommendation 18 : An information pack should be developed for potential SuperJANET information service providers, which clarifies the nature of the participation of the commercial sector in networking activities. (ACN)

Training and awareness

The proliferation of electronic information services, online public access catalogues and limited electronic delivery services now available, plus the need for some users to work remotely from their institution, has led to a need for an understanding of how to make the most effective use of the resources available. However, at the present time many of these resources have remained the province of the networking 'expert' within each academic department, who sometimes zealously guards the information from lesser mortals, but the demands on these services are increasing and there are not enough of the 'experts' to deal with the user demands. Training is required to allow the non computer-literate user of the network to become confident in using the computers and thence the network.

Training can take many forms and a range of packages should be available to meet the varied needs of the user community and courses should be available on the different aspects of the services. However, this solution is expensive in resources both for the expert and the user, but in a number of cases this type of training still provides a very effective means of learning and is flexible. The courses could be extended in the future to be run over SuperJANET, thereby reducing some of the costs involved, for example, in London with the use of LIVE-NET. Manuals and other written material should be provided to allow the user to find out how to use the network, but many of the documents will have to be tailored to fit the networking requirements of a particular institution. The basic training materials should therefore be available online, for adaptation locally by each institution.

The network applications themselves will have to change to become easy for the user to use and to fit into a user's working computing environment, whether it is on a PC or on a large mainframe. This can be achieved by an increasing use of client-server architecture, where each major resource will have standard servers which interact with a number of user clients. In this way, once the user has overcome the basics of acquiring keyboard skills the packages themselves should provide the training and help for the user to achieve the desired objectives.

Recommendation 19 : A wide range of training courses in the basic use of the network should be provided for end users, both face-to-face and later over the network, supported by appropriate documentation. (ITTI)

Recommendation 20 : The requirements of information intermediaries for training courses and documentation should be investigated. (ITTI)

Recommendation 21 : A study of the information access and handling skills required to use effectively networked information resources should be undertaken, in order to establish an inventory of necessary skills and to promote best practice. (ITTI and HEFC Libraries Review)

Recommendation 22 : There should be an investigation into group communication to provide help facilities distributed over the network. (ACN)

There is still a large number of academic staff and researchers who do not use JANET. This could be through lack of awareness of the network and the services that it provides, or it could be because the existing technical limitations of the network do not allow the services that they

need. SuperJANET provides an opportunity to provide the type of information services that meet the needs of groups who have not so far used the network. Ignorance must be overcome and the community of users expanded into non-traditional areas, in order to create a receptive audience for SuperJANET information services. There is a need therefore to publicise the existence of the range of services available on the network and its potential to assist teaching and research, but in terms that can be understood and related to by non-users. This raising of awareness must deal not only with the technical barriers to network use, but must be able to explain to users and enthuse about the potential uses of the network and of the services available. It is vital that the existence of the potential of SuperJANET is publicised and promoted to users, potential users and institutional managers within the community, but it is equally important that this is done with some sensitivity. A number of the 'new' universities still lack the appropriate connectivity and expertise to make full use of JANET and, in the same way, a number of the national repositories of records, archives and manuscripts lack the resources to make available, even in conventional form, many of the documents in their care. A too vigorous and insensitive promotion of the new and exciting information services that could be provided over SuperJANET may alienate certain groups in the community. There may be some scepticism to the, as yet unknown, benefits of SuperJANET and a reluctance to commit scarce resources to something which might be perceived as being 'ahead of its time'. On the other hand, specialised SuperJANET research applications, promoted as such, can act as demonstrators to the whole community, who can learn from and build on these applications.

Recommendation 23 : A variety of user studies and 'market research' should be carried out to develop a better picture of the penetration and type of network use among existing and potential network users and what their stated requirements are. (ACN)

At the same time, there is a need to understand more fully how network users currently use the network at campus level. Discussions about, and planning for, network information services rests on very slender knowledge about the preferences and practices of existing users. Very little is known about how network use breaks down by discipline or by category of user or type of resource and how this varies from campus to campus. SURFnet in the Netherlands contracted an independent study from an independent research centre of network users at six sites in 1991 and there is earlier work by SUNET. In a UK context, such investigation would help guide promotion, awareness and training activities, and highlight existing gaps and successes. The recent SuperJANET questionnaire should provide valuable information on the level of institutional network connectivity and could be used as a basis for further studies.

Institutional impact

The impact on the institution of SuperJANET connectivity will entail a number of hidden costs associated with the installation and support of an appropriate technological and organisational infrastructure.

Technological

At present, use of JANET requires the user to have access to relatively simple hardware and software - a simple dumb terminal is often adequate. In part, this is owing to the willingness of hosts to provide text-based services catering to a limited level of connectivity and to date,

making a resource widely available has taken precedence over advanced interfaces or functionality. SuperJANET will of necessity result in a departure from this approach, as the rationale for such a high grade network is to support new or enhanced services requiring network capabilities beyond those currently available. This will have implications on sites wishing to connect to SuperJANET beyond simply financing and maintaining the SuperJANET link.

- (i) End-users will need to access SuperJANET from locations distributed around the institution, local networking capabilities will need to be of at least comparable quality to SuperJANET. In many cases this may mean sites having to undertake complete or partial upgrades their of local network(s).
- (ii) The equipment used by the end-users will need to be capable of supporting multimedia applications.
- (iii) Many services may opt to utilise client-server architectures, which will require the user to have access to appropriate software. Thus the user's terminal will need to become a more complex and capable tool.
- (iv) Users will, ideally, come to perceive networked resources as simply an extension of their local computing environment. Hence they will expect to integrate networked resources with local applications in a seamless fashion, and will require workstation capabilities to allow this. From the service providers point of view, this also means there will be opportunities to take advantage of locally available facilities. Already some file archives hold material in PostScript and word processing formats, thus requiring a local processing capability.

Service/resource providers will need to be aware of the practical implications of SuperJANET connectivity, and where possible take steps to ameliorate the local support impact. These might include:

- (i) offering the service/resource at varying levels of quality/functionality where possible (*e.g.* offering text based interfaces in addition to graphical interfaces)
- (ii) using generic, readily available tools for clients and, at a community level, attempting to standardise where possible. The library community has already encountered problems in supporting the wide variety of software packages used to access CD-ROMs, and this situation should be avoided with SuperJANET services.
- (iii) the identification and community wide adoption of appropriate protocols for client-server applications.

The ability of JANET/SuperJANET users to access SuperJANET resources will have a direct bearing on the quality and development potential of these resources. Resource providers will need to be aware of the community's ability to access a service in order to determine:

- (i) the viability of offering a given service

- (ii) the level and quality of interface and functionality appropriate to the service. In some cases, this may be much lower than that technically possible over SuperJANET.

Some studies have been made on general network connectivity in the community, but these have been largely quantitative in nature. Additional information is now required on the quality of this connectivity. Furthermore, as many new services are likely to be focused toward specific user groups, studies will need to provide detail at the faculty or departmental level.

Information system strategies

Institutions may be forced to re-think, or, in some cases, develop and **implement** an Information Systems Strategy, which addresses the potential conflict between demands for local computing facilities and access to, and support for, networked information services. With the development of new teaching methods and materials and the move to a mass higher education system, universities will need to develop a comprehensive infrastructure which will allow an effective and positive approach to the organisation and distribution of information. Through an Information Systems Strategy institutions can ensure that appropriate local organisational structures are in place, which can integrate the activities of providers, organisers and delivers of information on their campuses. There is a need to gain intellectual control of the institution's information resources before technology can be applied. Many universities may currently lack the management structure to address the strategic issues relating to the effective use of information, and these effective management structures will need to be in place if the benefits of SuperJANET are to be fully realised. The current organisational divisions within universities may not be the most appropriate to provide users with the 'one-stop shop' approach to the use of networked information services that is required. To meet user needs there is likely to be a blurring of the established order, the development of new relationships and partnerships between different campus information services and, above all, a need for the various interests to work together. It is vital therefore that institutions develop coordinated support for networked information services.

Workstation numbers and the ability to install and support software are arbitrarily limited by available resources which are already exceeded by demand. The potential for conflict will be exacerbated by the move toward devolved budgetary models, in which individual faculties or departments pay for the provision or use of computing facilities. Institutions may find that their policies of devolved budgeting may mean that they are unable to make, and carry through, the necessary central strategic decisions in the interests of the institution as a whole.

It is equally important to establish a 'networking culture' within institutions and between subject communities, so that both the local area network and JANET are used for routine communication and for accessing and delivering information. The provision of networked information resources, such as BIDS ISI and EMBASE, and the Mailbase service have had the effect in introducing many new users to JANET and has led to further exploration of the network. Institutions will need to ensure that there is widespread awareness of the potential importance of networks for information access and delivery throughout the institution in order

to create a receptive climate for SuperJANET and to ensure the maximum return on their investment in a SuperJANET connection.

Recommendation 24 : Higher education institutions should develop a policy for the future development of information services within the institution, to take into account the library, computing services and other technology-based services. This policy should aim to institute an appropriate organisational structure and to ensure the optimal coordination of services and hardware requirements. (HEFC Libraries Review)

Professional challenges

As resources for research and learning become increasingly available over the network, the library profession will be less involved with local collection based activities and more concerned with the exploitation of remote resources. In part this might entail an extension and development of such current functions as interlibrary loan processing and bibliographic searches, using increasingly sophisticated tools. However, a more significant impact will be made due to the increasing provision of end-user oriented services, of which BIDS ISI and EMBASE may be seen as early examples. As end-users become empowered to conduct their own bibliographic searches and order documents online, there will be an increasing requirement for end-user support in the form of training and help-desk facilities in order to provide the user with the skills needed for the effective exploitation of online resources. As an adjunct to this, the librarian will need to become familiar with not only the techniques required to exploit a given resource, but also the relevant tools and technology.

In short, librarians will continue to move from a collection management role towards a user support and educational one, and in so doing will begin to work in further areas traditionally the preserve of an institution's teaching staff or provided by other academic services (*e.g.* Computing Services). In some cases, this may result in librarians either moving from the library into newly defined roles in other areas, or carrying out tasks broadly similar to those carried out in parallel elsewhere. This may lead to an identity crisis within the profession, and even endanger a librarian's professional status. Problems will arise in maintaining currently established career path models, when the librarian is performing similar activities to those in related, but less clearly structured professions. It is also apparent that information professionals outside the academic community will have access to many of the key online resources and academic librarians may, for the first time, find themselves in direct competition with commercial operations.

There will at the same time, however, be new opportunities and challenges for librarians choosing to adhere to the more traditional aspects of librarianship. For networked services to be effectively exploited, appropriate resources must be easily identified by the end user, and this in turn will be need to be based on well developed information management skills. Furthermore, the aggregation of small collections, the development of new collections, and the creation of new types of information service will all require the skills of librarianship and information science.

It is likely therefore that there will be an extension of the traditional (local) information management role into the electronic area and librarians and information specialists will work to:

- manage their institution's information expenditure efficiently
- gather/analyse and report/act on statistics of institutional information usage
- create, foster, describe, organise and sell the institution's own electronic information resources/electronic publishing output
- support the delivery of multimedia courseware packages
- act as advisers, consultants, evaluators and intermediaries for networked information resources.

Recommendation 25 : The potential new roles for librarians should be investigated and the requirements for training and staff development identified. (BAILER, Library Association, SCONUL/COPOL & HEFC Libraries Review)

Protocol and format standards

The effective use of network information resources will depend on a number of communications requirements which await technical solutions: the ability to identify resources of interest; the ability to interact with, and consolidate results from, diverse resources; the ability to request and pay for services; the ability to share data between applications. As network resources multiply, and distributed information systems appear, the benefits of standardisation are apparent. However, application protocol development and information structuring activity are at an early stage. Future network information systems will exploit standards which are newly defined or still in preparation. These will form the basis for various implementation agreements and profiles within particular communities of users and the development of specific application-oriented formats and structures. It is important therefore that SuperJANET projects implement appropriate standards. It is critical that future cooperative activity should not be constrained by inappropriate technical choices. This concern should be balanced against the equally critical need to begin to get experience in the use of new approaches.

Recommendation 26 : A technical report outlining existing standardisation activities in the area of information representation (structured documents, graphics, multimedia etc.) and the relationship between these and preferred future directions, would be of benefit to the community. (ACN)

Recommendation 27 : Initiatives which clarify standards and application layer protocol issues should be promoted. (ACN)

Information retrieval

Terminal access is the dominant model of use of information resources. Applications are beginning to be built using the client-server model, which exploits the power available on users' desktops. At the same time, information systems which build on computer to computer links

between database applications are now being talked about. Examples from the library world are dynamic links from abstracting and indexing services to holdings files; or from union catalogues to local circulation systems. Search and Retrieve (ISO 10162/3) is an OSI application layer protocol standard which has been developed to allow applications to query databases on remote servers. Z39.50 is a US NISO standard, which is a compatible superset of SR. SR/Z39.50 manages the communication of messages between client and server and the return of data. Distinctively, it also encompasses the use of generic search and exchange formats which may be mapped to those of local systems. These now exist for bibliographic applications and are being developed for other application areas, enabling the construction of systems which give users access to heterogeneous remote resources through existing local user interfaces.

SR/Z39.50 has emerged as the protocol of choice for distributed information retrieval systems, but, as yet, it is not widely implemented. The first commercial products which incorporate SR/Z39.50 appeared in late 1992, and work is underway to develop a WAIS system which supports Z39.50-1992. However, it will be some time before it routinely supports widespread interworking of systems, and many implementation issues are outstanding. The UK academic community has almost no experience of implementation, lags far behind developments in North America and the Nordic countries, and has little or no input into the ongoing standards process.

Recommendation 28 : Initiatives which involve experience with SR/Z39.50 should be promoted. (ACN)

Electronic Data Interchange

The computer to computer exchange of trade and commercial data is becoming more important within universities, as libraries wish to use network communications with book and periodical suppliers and the university administration is likely to want to use EDI for the transfer of orders and invoices from and to a wide range of suppliers. The book world has been active as an EDI community. Book Industry Communication (BIC) coordinates UK activity and is heavily involved in European initiatives. There are several UK partners in the EDILIBE (EDI for Libraries and Booksellers in Europe) project. Future developments in other 'communities' should draw on this work as appropriate.

Recommendation 29 : Work being done in the area of EDI should be coordinated, there is a need for a body to maintain a watching brief and pilots are needed to examine the implications of increased use of EDI by universities. (JISC)

Controlling access

Distributed authentication, online charging and security features all require urgent investigation.

Recommendation 30 : The SuperJANET Project Team should cooperate with the British Library and BIDS and other data centres, to develop solutions to the issues of authentication and security. (ACN)

Representation of information objects

Communicating applications need a common understanding of the information objects they exchange. Standardisation and information structuring activity is progressing at different levels and in different contexts. This work is in early stages, and fundamental elements are not yet in place: a commonly implemented SGML Document Type Definition for articles is still in development, for example. It will be some time before there is routine interchange of information objects between communicating hypermedia and multimedia applications.

Resource discovery and emerging network information tools

A generalised view of resource discovery requirements is presented below, which introduces various tools which have begun to be widely used on the Internet. These tools (Gopher, WAIS, Archie, etc.) are a valuable step towards easing use of network resources.

Directory services

X.500 and other directory services will become more important and store information about many objects in support of the communications requirements of applications. One important development is the possible migration within the academic community of the NRS and the DNS naming services to X.500. X.500 may be used to store resource guide data, to route queries to particular services and return results, and to allow search and retrieve of textual and other data resources. The BLRDD is supporting research at Brunel University and at University College London into potential bibliographic applications of X.500.

Recommendation 31 : The SuperJANET Project Team should monitor the work being undertaken into the potential bibliographic applications of X.500 and its relevance to future SuperJANET projects. (ACN)

Resource discovery and description

The number and variety of resources and services available over the network has been growing steadily since the implementation of JANET. This is likely to continue at an increased rate as:

- (i) improved network capabilities allow for new types of services to be made available
- (ii) increased connectivity at the local level creates a larger, and increasingly diverse, user community
- (iii) economic forces encourage the sharing of resources where possible

The end-user is therefore presented with a number of inter-related problems:

- (i) awareness of the availability of resources
- (ii) the identification of suitable resources for a particular task
- (iii) access and utilisation of an identified resource

Attempts are already being made to develop tools and techniques to assist resource exploitation. To date, approaches to resource discovery fall into two broad categories:

- (i) **Resource guides** - essentially printed directories, though they may be made available electronically. Examples of these include *Internet-Accessible Library Catalogs and Databases* (the St. George Guide) and *OPACs in the UK: A List of Interactive Library Catalogues on JANET*.
- (ii) **Resource access tools** - software and mechanisms designed to facilitate access to, and sometimes use of, resources, (e.g. Gopher, WAIS, NISS Gateway). A detailed summary of those currently available, and of work in progress, can be found in a report produced by the Joint IETF/RARE/CNI Networked Information Retrieval Working Group 1 (6).

In some cases, Hytelnet for example, some attempt has been made to combine the two solutions. Such combinations might properly be termed 'resource discovery tools' facilitating both selection and access. There are still, however, a number of deficiencies in present approaches including:

- (i) access tools tend to be limited to resources of a particular type or method of implementation. A currently popular example is the Gopher system - while offering an attractive, easy to use, mechanism for accessing a large range of distributed resources, it effectively prevents the user accessing many other resources which are not part of the Gopher environment.
- (ii) resource guides are either incomplete, or restricted to narrow subject areas. Furthermore, that sheer number of resources and their rapid proliferation makes the compilation of such guides difficult, if not impossible using traditional techniques unless they are very specifically focused.
- (iii) the variety of data formats used and access tool techniques inhibit interworking.

In short, at present the end-user has no facility whereby a query or resource request can be formulated and an appropriate response be selected from the set of all available resources. In part this is because the available access tools have emerged on an ad-hoc basis, usually targeted toward a particular resource or for a specific user group. Likewise, most of the existing resource guides have been compiled in isolation by individuals or groups attempting to identify resources in a restricted area of interest. Recently some effort has been made toward co-ordinating the preparation resource descriptions (the Coalition for Networked Information's TopNode initiative) and the integration and/or development of access tools (the Integration of Internet Information Resources group sponsored by the Internet Engineering Task Forces).

However, the problems associated with user access, and the existing and potential requirements of users and service providers are still poorly defined. Discussions within the JANET community have identified a number of inter-related requirements which should be supported by resource discovery tools:

- (i) **Resource descriptions** - methodologies need to be developed which will allow for a resource to be adequately described in a consistent manner. Such descriptions need, as a core:
 - a) description of the resource itself
 - b) classification of the resource - by type and content; this will aid searching of the guide, but also allow for the possibility of automated resource selection based on user queries.
 - c) routing information - network address(es) of the resource
 - d) technical requirements needed to use the resource
 - e) costs associated with using the resource
- (ii) **Access mechanisms** - tool(s) are needed to connect the user to interactive resources or submit requests to non-interactive ones. Due to the varying technical capabilities of end-users the access tool should be capable of filtering out unusable resources, or offering the resource at an appropriate level. This will entail the tool having access to knowledge of the end-user's connection, possibly through interrogation of the user's terminal, access to a database of site connectivity, or a combination.
- (iii) **User interaction** - the resource descriptions and resource access tools should be implemented together as discovery tools. If more than one tool is used, this should be concealed from the user and appear as a single entity. The discovery tool(s) should allow:
 - a) Interactive use - the discovery tool(s) should present itself to the user in a form appropriate to the end user's technology. Where appropriate it should support multi-media. The guide should permit the user to both search and browse the guide itself and, ideally, all or part of the actual resources.
 - b) Transparency - the discovery tool should also be capable of processing locally generated user queries to appropriate resources (appropriateness being determined by both the ability of the resource to satisfy the request and the cost-effectiveness of access to the resource). In such accesses, the guide may need to engage in a dialogue with the end-user. Making the discovery tool transparent will facilitate its incorporation within the 'scholar's workstation' - the tool of an individual user allowing the development of an individual view of network resources and their integration with local processing facilities.
- (iv) **Item retrieval** - items identified via the discovery tool for retrieval by the user should be made available in user selectable formats (*e.g.* suitable for use with a particular word-processor or graphics package). Rather than have resource providers store material in a multiplicity of formats, the discovery tool should incorporate conversion mechanisms.

(v) **Management -**

a) data maintenance: due to the number of resources and the rapidity of change, data will need to be maintained using a distributed model.

b) user management: facilities will be required at a site level (at least) to control to which resources an end-user has access either disallowing usage of a resource entirely, or restricting usage in terms of duration or capabilities.

In order to implement such a discovery tool in the context of SuperJANET will require co-operation at a community wide level. In particular:

a) The task of resource description will need to be widely distributed in order to ensure comprehensive and accurate coverage.

b) The selection and use of standards and protocols supporting the interworking of access tools will need community agreement.

As the boundaries between JANET, SuperJANET and other networks should be transparent to the end user, existing technologies and initiatives should form the basis for further development. If the development of a world-wide, multimedia-based virtual library is to be made possible by SuperJANET and other high bandwidth networks, then there will be vital need for access tools and resource guides.

Recommendation 32 : A working group should be established to bring together those parties actively interested in resource discovery tools and this groups should:

- (i) *formulate a complete specification for such tools*
- (ii) *establish contact with related groups worldwide*
- (iii) *determine a standard model(s) and procedures for resource description*
- (iv) *examine existing tools for applicability and where necessary implement the development of new tools. (ACN & BLRDD)*

A new role for the publisher

It is possible to envisage that one day most formal communication of research results currently done through journals and conference proceedings might be done on computer networks. With the advent of SuperJANET, the question may be asked about the role of those who have traditionally been associated with the production of journals, *i.e.* editorial boards and publishers. The tasks that these perform will remain, although the application will change. There will still be need for handling submissions, maintaining quality, designing and presenting in order to minimise work for the 'reader', preparing the article into its accessible form, and ensuring that there is open access to and adequate distribution of the information throughout the world.

The main concern over any major change in media is one of maintaining quality. Quality covers four areas: the quality of content currently sustained and improved by editorial boards and the process of refereeing; the quality of content improved by sub-editing; the quality of design that

makes access to information efficient for researchers; and the quality of the visual appearance or interface that allows the material to be used easily, both for text and the figures. The reason for their insistence on a formal quality assessment process before 'publication' (*i.e.* the refereeing process), complemented by the other elements of quality, is that it reassures academics about the reliability of what they are looking at. The other aspects of quality mean that they are not interrupted in their thinking by coping with awkward phrasing and uncorrected errors, they know how to navigate the material and can find what they want and then use it easily.

Maintaining quality of content

The work of ensuring quality of the content is shared between the editorial boards and the publishing houses. Most publishers support the editors of journals either financially or in kind and also run the administration of editorial boards. The major learned society publishers go further and employ expert staff, often graduates with doctorates, to choose appropriate referees, as requested by the academics in the societies to free them up to do research. The refereeing process is interactive and leads not only to decisions on whether or not to publish, but frequently to advice on how to improve their work and its presentation. There are suggestions in the literature for alternative ways of organising peer review - primarily using readers' comments and marking. These differ fundamentally in concept from the present systems which require peer review before papers are admitted to the body of published knowledge and to some extent define 'publication' itself. Other proposals, for example, the US NSF way, recreates the editorial board in another guise. SuperJANET linking to Internet could speed up the transmission of material for refereeing, which could improve the currency or research available.

Maintaining quality of presentation

In any new electronic publishing world, there will still be need for the skills of publishers in maintaining quality for usability of journals and other electronic products and services.

- (i) **Sub-editing** Publishers contribute to the quality of content by making sure that all the parts of the document are accurate in internal referencing, that they comply with accepted and frequently standardised conventions and nomenclatures and that the language used is understandable.
- (ii) **Design** Publishers with editorial boards design article structures and layout so that the readers can easily find what they want out of any article. Different design is necessary for different disciplines.
- (iii) **Appearance** Text is easy to read and images interpretable.

These three main areas of maintaining quality may change in application and name, but the tasks will remain. Quality of content, design for access and usability of the interface will be key areas in helping academics accomplish their current awareness and research. Indeed in the relatively unfamiliar world of software-aided communication via the computer screen, they are likely to become much more pertinent to the efficient transfer and searching of information. For example, in the pre-print databases on higher energy physics, the papers are written in TeX,

but not all are readable by the computer when they arrive and because the researcher running the system has no time, many papers are simply 'dropped'.

Maintaining global access and distribution

Publishers seek to try obtain as much coverage for their material as possible, through advertising, donation of free copies of journals to abstracting and indexing services, attending conferences, setting up local offices in many parts of the world. Whereas putting one copy of an article on a network might appear sufficient, already to make life easier for network communication, there are four files of the higher energy physics reprint database, spread around the world. There will be new needs for cataloguing and indexing services. There will also be need both to ensure global coverage on networks, as well as anticipating the occasional network problem that should not result in stopping research work, and to find ways to make material available to non-network users, whether in developed or developing countries. In particular in UK, much research is not accomplished in academic institutions and there are many research department in industry and military establishments.

Commissioning work

Finally in the expertise that publishers have there is one important one - the identification and soliciting of new work: the review, monograph, text and other evaluated work that is so important in providing newcomers an entry point to or overview of active research. Some authors are naturally prolific, others reluctant writers. Publishers have sought out the best and encouraged them to write, even hand-holding them through difficulties of finding time or typing or using computers. The latter often make the best contribution: it is important in any future scenario that the world of academic communication is not left to the prolific.

Avoiding re-invention of publishers

In some proposed future scenarios, the role of publisher is not discussed, or even deliberately excluded. The tasks outlined above indicate that there is likely to be a need for these functions and to exclude those with the skills already developed, will waste much of academics' and researchers' time, while starting again with what already exists. The publishers have an important role in maintaining quality, even if the processes, applications and media change.

Recommendation 33 : The Publishers should be encouraged by strategic experiments to use, transfer and develop their skills and expertise for new electronic publishing opportunities, so as to make the use of SuperJANET effective and efficient for scholarly communication and teaching.(ACN)

The British Library

The British Library Draft Strategic Plan 1993 - 2000 describes its vision as providing access to its collections within the reading rooms and by remote access. The Library is a library of

both first and last resort and has two constituencies of users: the users of today, with an increasing emphasis on access to information from workstations, and posterity, with demands for preservation, integrity of the collections and collection building. The Library's long-term plan is to make available text, sound and visual images, including video, wherever possible, to users in the reading rooms and to the remote user. Service demands arising from this will contribute to the Library's priorities in the preservation of material in digitised form. Electronic publishing will have an effect on the Library as a world centre for storage and access to digitised texts for scholarship and research. The Library will seek to establish partnerships with the academic and private sectors to collect jointly and keep nationally important material in digital form. In conjunction with other media archives and appropriate bodies in the UK, the Library intends to continue to urge Government to extend legal deposit provisions to cover electronic documents and multimedia materials.

The British Library, through the Document Supply Centre, the rich resources of the Humanities and Social Sciences and the research and pump-priming funding of the Research and Development Department give it a uniquely important role in the UK library and information community. Through its funding of the UKOLN, the British Library has enabled the definition of a number of key issues that must be addressed if a coherent national networking policy is to develop. The potential of the British Library as a provider of valuable information resources, and as a central player in the development of future networked information services, should of course be recognised and encouraged. It could define a number of major library and information SuperJANET projects, which could be based on its resources of manuscripts, rare books, newspapers and sound recordings; through the National Bibliographic Service, it could coordinate community efforts to describe and classify networked information resources; and through the BLDSC it could develop a pilot image-based document delivery service. These SuperJANET pilots could be coordinated with similar initiatives to ensure that there is the maximum interoperability of services.

Recommendation 34 : There should be coordination between the British Library and the Joint Information Systems Committee, in their technical planning activities to ensure that funding is directed to achieve the maximum interoperability of services. (ACN & BLRDD)

References

- (1) *Networks, libraries and information : priorities for the UK*. Bath: UKOLN, 1992.
- (2) *A report on book and journal spending 1978/79 to 1989/90*, London: Council of Academic and Professional Publishers of the Publishers' Association, [no date].
- (3) *OBN (Open Library Network) : final report : from the project to library users*. Pica\SURFnet, 1992.
- (4) *Teaching and learning in an expanding higher education system*. Report of a Working Group of the Scottish University Principals. CSUP, 1992.

- (5) STONE, Peter. *JANET: the educational and research network of the United Kingdom*; in ZUCK, Gregory and FLANDERS, Bruce. Wide-area network applications in libraries. Meckler, 1992.
- (6) Joint IETF/RARE/CNI Networked Information Retrieval Working Group. A "Consumer report" on networked information retrieval: tools and groups. - Draft version 2.0., November 1992.

Appendix 1: study group membership

Michael Breaks, University Librarian, Heriot-Watt University (Study Director)
Lorcan Dempsey, Research Officer, UKOLN : The Office for Library and Information
Networking
David Pullinger, Institute of Physics Publishing
Neil Smith, British Library Research and Development Department
Aileen Wade, Science and Engineering Librarian, Sheffield Hallam University
Shirley Wood, Joint Network Team
Colin Work, Information Specialist, University of Southampton

Comments on earlier drafts of the report were made by Peter Stone (Consultant), Dennis Nicholson (University of Strathclyde) and John Lindsay (Kingston University).

(February 1993)

Briefing paper on community projects and expertise

Dr Anne Mumford
Loughborough University

This paper is a briefing paper for the Committee. The remit was to provide information for the Committee and projects (particularly ISC funded projects) which might be relevant to the use of IT in providing library services. The term 'online document' is used very loosely to refer to information which might be provided online. We could probably do with a glossary of acceptable terms to use!

The paper consists of 3 parts:

- a preamble which states some considerations for the Committee
- a classification of the problems together with an indication of where relevant expertise may be found - this is inevitably incomplete and concentrates on the ISC funded projects
- brief details of the relevant projects.

Preamble

Projects or services?

I think that the Committee needs to recognise that there is a large difference in many of the tools in the area of online document provision. Many tools have emerged from projects. The author of the Archie software, Peter Deutsch, described this as being a project at the recent EARN conference and stressed the need for supported and maintained tools for networked information. We need to offer 'industrial strength' software on our campuses. This may have emerged from projects, but we need maintenance, upgrade, development and support.

'What' not 'How'

There is too much concentration, in my view, on 'how' we can do things and not 'what' we want to do. There is a desperate need for the vision to be stated. A strategy for getting to that point

can then be developed. The classification used in this paper may help to focus attention on the different components which are part of this problem. At the moment there is a great deal of attention being paid to today's (yesterday's?) solutions. These will not be tomorrow's solutions.

Recognising the components

It is extremely useful, I feel, to break down the problem of online document/information provision into a series of components. These components each have a different development path. There is a need for an overall strategy, but each component will have a strategy. Some of these are well understood with projects, pilot services and services underway. Others are less developed. In each area there are individuals and projects in the community which can offer advice and examples. If the problem is broken down in this — or another — way, then we can also ensure that any pilot or service developments cover all components.

Market forces

Experience in computing services over the years certainly leads to the conclusion that we must follow the market. In house developments are fine for projects but not for services. Strategy must be market led. Winners must be backed. The component strategy may help in reducing the number of (inevitable) dead ends we go down.

A proposed classification of online document provision

This involves many components. This section divides up the components, describes the briefly, and then indicates the projects in the community which might be relevant. The classification may not be right or complete. The Committee should see it as a first attempt at doing something which could prove vital in setting up pilots.

The classification proposed is shown below. There are two levels in this classification.

- 1 Authoring
 - 1.1 Scanning
 - 1.2 File Format
- 2 Accessing the Document
 - 2.1 Finding the Document
 - 2.2 Ordering a Document
 - 2.3 Paying for the Document
- 3 Looking at the Document
 - 3.1 User Interfaces
 - 3.2 Document Viewers
 - 3.3 Document Output

- 4 Using the Document
 - 4.1 Finding Information
 - 4.2 Editing
 - 4.3 Cut and Paste

Creating an online document

This is the process of getting the information online. Many current projects and pilot services assume that the information is currently held on paper. This is not always the case and will progressively less so.

Scanning

This is the 'state of the art' for most current services. The information being provided is available in printed books and journals. This is scanned and sent to the person requesting the information either electronically or perhaps via a fax machine - fax formats are frequently used for storage. Many of the scanned images are then deleted rather than being stored. This is for copyright reasons. There is also a practical point in that something less than 10% of articles are requested more than once. The disadvantage with this method is that the stored information is at a relatively low resolution (typically 300 dots per inch). The information in the document has been lost - it is now a series of dots and not text or vector graphics. Indexing is at best difficult. It is also losing information if it has been generated online.

Relevant expertise Most of the useful expertise is to be found in the current services being offered by CARL, CORE (though text and indexing is done here). The GEDI specifications may offer a specification for this form of information if standards are to be adopted (Andrew Braid of the British Library reported on these at the recent SuperJANET meeting). We will certainly see this requirement for scanning continuing and it maybe that adopting a specification is a good idea.

Authoring

This refers to the online creation of documents, specifically those involving a number of different types of information - text, images, video. It also refers to the creation of text to a certain style, for example a publisher providing an SGML Document Type Definition within an authoring software package.

Relevant expertise The SGML project at Exeter can provide information on the use that publishers and their authors are making of SGML tools. The CTISS File for April 1992 held a survey of Authoring Tools. Other surveys are certainly taking place - I know of one at De Montfort University. CHEST have a deal for the Guide package. The Authorware package is also popular. Many of the ITTI projects are using authoring tools such as Guide and Authorware. The TLTP projects will also be using the various tools around. It is interesting that the Open University does not use commercial software for their own materials - they write the software themselves to it is future-proofed and has a longer life.

File formats for storage and interchange

This is a critical issue and one which has been familiar to computer graphics experts for some time as they try to move pictures between different packages, output devices and machines. I think that it is inevitable that a number of formats will exist for some time - if not for ever. The community needs to consider the adoption of some standard specifications of file formats. Note that just specifying a file format is not sufficient - there are often many 'flavours' of the same named format. There also needs to be consideration of the use of ISO standard formats versus proprietary formats which may require a 'reader' licence for everyone accessing the information.

Relevant expertise The Advisory Group On Computer Graphics can provide expertise in graphical (vector and image) formats and on linking text and graphics. The SGML project at Exeter has information on the use of SGML in the community and has links with commercial and other users. The Text Encoding Initiative has considerable expertise in the use of SGML. There is work on SGML and ODA conversion at UCL. User group profiles such as those under the CALS initiative, the Association of American Publishers may be relevant. The Nottingham ITTI project is producing a deliverable on standards. The Southampton TLTP project is developing Microcosm for providing a links database between different - and possibly - distributed multimedia documents. The SuperJANET projects relating to images and multimedia information are relevant. The Oxford Text Archive provides texts in a range of formats. A number of people in the community are involved in BSI and ISO committees. The ISC belong to DISC and meetings of people in the community who are on various standards committees are held from time to time. This covers all areas.

Accessing the document

The document has to be found, ordered and (if necessary) paid for. The issues of copyright are clearly relevant but are ignored for the purposes of this paper.

Finding the document

There are a number of network tools around to help catalogue and find information which is available. Tools include ones for setting up servers which are able to go round the various registered sites round the world looking for relevant documents for the person requesting information. Archie, Gopher, World Wide Web are all relevant tools for finding and accessing network information. Many of these tools have been developed by projects and are project funded rather than commercially available. Speakers at the recent EARN conference looked into the future and suggested that the Internet was likely to become more commercialised. This implies charging, but also a more supported service. There are other relevant issues. One is the need to establish a strategy for search and retrieve tools. The Z39.50 (and WAIS) standard seems the preferred direction. Cataloguing software is also relevant. For more background, I can recommend the book by Krol, *The Whole Internet: user's guide and catalog*. (Sebastopol, CA: O'Reilly & Associates, 1992).

Relevant expertise Network tools are being considered by the RARE (association for research networks in Europe) organisation. Jill Foster of NISP chairs one of the groups. WAIS is being used by NISS who have developed the NISSWAIS service and done work on the user interfaces to WAIS. The IUSC's Database working party have carried out investigations of cataloguing software. The St Andrew's ITTI project is doing work on training materials for the BRS software.

Ordering a document

Having found the document it needs to be ordered.

Relevant expertise British Library. The BIDS service are currently looking to provide a document ordering service for articles found. This will link in with providers of documents and is expected to be an online ordering service to a copying/postal link, *e.g.* to the BL. Services such as CARL and MELVYL are currently available via the NISS Gateway. The SuperJANET pilot on document delivery is relevant.

Paying for the document

The services will inevitably involve charges.

Relevant expertise Computing services have had to face charging for online printing and have mechanisms in place. PCCC are holding a meeting in charging at Oxford Brookes University - it might be worth getting a report. BIDS are actively looking at charging via credit cards for their document delivery service.

Looking at the document

The 'virtual library' is conceptually everywhere - the student bedroom, the office, *etc.* The interfaces need to reflect this. Like all things, this ties in with other parts of the classification. The file formats issue is particularly relevant here as this affects what can be viewed. The scanned image needs to be viewed at the resolution at which it was scanned. The SGML file can be output as suitable resolutions and in a way which reflects the output medium

User interfaces

This refers to both the graphical user interface (GUI - pronounced goo-ee!) and to any human computer interface aspects which must be taken into account.

Relevant expertise ITTI projects are relevant: Edinburgh one on X windows; Kent one on Hypertext (also TLTP project). The IUSC's Workstations Working Party has a vast amount of knowledge on the various interfaces available and the relevant software. Various CHEST deals are available.

Document viewers

Having found the required document and received it, the requester needs to be able to view it within their chosen style of menu (*e.g.* Microsoft Windows, X Windows). The document may be stored in a way which is not suitable for output on all media. This needs to be thought about.

Relevant expertise The Advisory Group On Computer Graphics are just completing a report on PostScript previewers. NISS are developing a subject-based service for information which is starting with output from the ITTI and CTI projects. This uses indexed PostScript files. Various public domain packages are available for viewing different file formats. A survey of those suitable for a range of popular formats might be useful. Conversion tools are certainly relevant (AGOCG have a report on some that handle graphical files). SGML and ODA viewing software is relevant and these also need to be evaluated.

Document output

The information we are mostly talking about today is mostly the kind of information we see on paper. There is therefore a need for output. The output could be onto paper or onto a higher quality medium such as bromide.

Relevant expertise The review of the Microform service at ULCC led to a report from Anne Mumford on the output facilities available in the community. These do vary. AGOCG are looking to set up a 'dating' service to match those with equipment with those with output needs that cannot be met locally. The expertise described above under *Document viewers* is also relevant here.

*Using the document**Finding information*

This relates to the way that a document is indexed. The scanning of documents does not make indexing easy as the indexing must be done separately. Much online 'indexing' is really word counts.

Relevant expertise The CORE project in the US stores both text and images. The indexing is done from the text and the pictures are also indexed. NISS are indexing the PostScript files stored in their subject based service under development. The TLTP project at Loughborough is concerned with the use of Metadata to index information - which includes images - in a personalised way.

Editing

Having got the online document users will want to edit it. How can this be done? This relates to the file format issues. Copyright and fidelity are also (more difficult) issues.

Relevant expertise The Pica libraries in the Netherlands have done work on document fidelity - there is some software that provides a checksum.

Cut and paste

Again copyright issues are relevant. On the technical side we need to decide what the user can have access to - the words, the pictures, the images? What we want to do relates back to the file format issues.

Relevant expertise AGOCCG have done work on access to graphics.

Expertise in the community

This list does not claim to be complete, completely accurate or even fair. It is hoped that it does give a useful extension to the discussions in the classification. Further details and contacts can be provided.

AGOCCG

The Advisory Group on Computer Graphics was set up in August 1989 with Dr Anne Mumford of Loughborough University as full time Co-ordinator. The Group contains representatives from bodies involved in contributing funds and manpower for centrally co-ordinated work on computer graphics. This initial impetus came as a joint initiative between the UFC's Information Systems Committee and the SERC. The other research councils, notably the NERC and the AFRC have played active roles in AGOCCG activities. The Group meets quarterly and sets directions for work to be directed by the Graphics Co-ordinator and other groups in the community.

The work of AGOCCG has been wide ranging and includes: software evaluations; surveys of hardware; production of technical reports on new technologies and areas of interest; courses for support staff; workshops on new areas, *e.g.* graphics and documents, scientific visualization, multimedia.

BIDS

The BIDS team are actively looking at the possibility of linking the finding of a journal article with the ability to order it electronically. They aim to provide the ordering service interface to a possible range of suppliers. The delivery of the document may be electronic, but not necessarily. There are many issues to be sorted out: costing, charging, who offers the delivery service, is it routed through the requesters' local library.

Campus Information Services

Various CWISs can be accessed through the NISS gateway. There is an IUCC/SCONUL meeting on CWISs at Easter at Newcastle.

CTI

The initiative is concerned with offering support to discipline based areas to help them use computers in teaching. This project was presented to the Committee in January.

ISC/DISC Group

This is an ad-hoc committee of representatives from the community who are nominated by the ISC onto BSI committees. Les Clyne from the JNT is the secretary.

ITTI

There are over 30 ITTI projects covering a wide range of areas. Some may be useful for expertise gained in using authoring software, storage formats, interest and adoption of computer based materials.

IUCC Committees

The IUCC Committees for Software, Training and Information have relevant expertise. Many of the funded projects have gone through these committees for approval. Surveys of materials, software *etc.* have been carried out.

NISP

The NISP service is currently text only. The statistics on take-up and interest may be relevant. The service (like BIDS) may well have been the 'carrot' to interest people in using online information. Jill Foster of NISP has knowledge of network service software.

NISS

The National Information on Software and Services aims to 'utilise facilities provided by JANET to encourage the dissemination of information about computers and their use throughout the academic community'.

The longest running service is the NISS Bulletin Board. All services are accessed through the gateway (32000 calls in November from 162 JANET addresses). Besides the Bulletin Board, they offer access to: NISS Public Access Collections (NISSPAC); NISS Wide Area Information Server (NISSWAIS); Library Catalogues (OPACs); Campus Information Systems; Bibliographic Services (inc: Melvyl, CARL, STN, BUBL); Directory Services (inc: YellowPages, Paradise, WAIS); Archive Services (inc: HENSA, Mailbase, BIRON); General Services (inc: Guest-Telnet, ASK, CONCISE).

Oxford Text Archive

The Oxford Text Archive is a facility provided by Oxford University Computing Services. It has no connection with Oxford University Press or any other commercial organisation and exists to serve the interests of the academic community by providing archival and dissemination facilities for electronic texts at low cost. The Archive offers scholars long term storage and maintenance of their electronic texts free of charge. It manages non-commercial distribution of electronic texts and information about them on behalf of its depositors. The Archive contains electronic versions of literary works by many major authors in Greek, Latin, English and a dozen or more other languages. It contains collections and corpora of unpublished materials prepared by field workers in linguistics. It contains electronic versions of some standard reference works. It has copies of texts and corpora prepared by individual scholars and major research projects worldwide. The total size of the Archive exceeds a gigabyte and there are about a thousand titles in its catalogue.

Rutherford Lab ESPRIT Projects

There are a lot of projects and relevant expertise here. The ARGOSI Esprit project looked at access to graphics across networks. The RIDDLE project is concerned with scanning in contents pages of journals and making the information available as part of the online catalogue. The project is also investigating making the articles available. The MIPS project is concerned with multimedia information and is going to use HyTime (SGML application for multimedia information). This could provide useful input.

SGML Project

The SGML project at Exeter University is funded by the ISC. The project is managed by Paul Ellison and the project officer is Michael Popham. The project has been building up links with people using SGML in the community. An evaluation of software is to be initiated by the project working with the IUSC. This may lead to a recommendation to CHEST. There are people in the community with SGML expertise. There are also others outside the community who academics work with who are using SGML, *e.g.* publishers. AGOCG are funding a project at Exeter to produce some SGML training materials for HyTime (SGML application for multimedia) and NISS have also been talking with them about using SGML for future projects.

SuperJANET Projects

Full details can be read in Network News, No 38, December 1992. To show the use of SuperJANET there will be a number of pilot applications run across the 6 sites included in the first phase of connection. These are:

SuperJANET Applications

Teaching	medical training using video of operations
Computing	Supercomputer Data Visualization and Interaction Molecular Modelling Oil Reservoir Studies Computational Fluid Dynamics Heterogeneous Distributed Supercomputing Facility
Information Resources	Library Document Distribution Special Datasets Electronic Journal testbed
Remote Consultation	Pathology Consultation Network
Access to Remote Facilities	Brain Imaging Remote Sensing Data

Potentially, many of the projects are relevant though. The issues of searching for information of any sort, finding it in an intuitive way and being able to get hold of it locally and legally at an economic and realistic cost are covered in part by many of the projects. The label 'documents' and 'journal' only really applies information as we know it on paper, the harder challenge is to have access to the information itself, not the image of the information. The other projects probably touch more on these issues.

Michael Breaks (Heriot-Watt) has set up a study group to look at the Information Resources pilot and future projects which might use the facilities offered. This consists of the following people with responsibilities as indicated: Lorcan Dempsey (UKOLN - new publishing opportunities), David Pullinger (Institute of Physics Publishing), Neil Smith (B.L. - sound; course-ware delivery), Aileen Wade (Sheffield Hallam - pictures; archive documents), Shirley Wood (JNT - document delivery), Colin Work (Southampton - network information retrieval).

A meeting on the 26th January, organised by Shirley Wood, gathered together various interested parties in the community to discuss their projects. The need for a common understanding and the adoption of standards seemed to come out of the meeting. The group are to meet again in 6 months time. The experts recognised the importance of the strategic

decisions to be made by the Library Review Committee - copyright being a critical issue. The technical documents from the IT Committee could usefully be passed on to this group.

Text Encoding Initiative

'The Text Encoding Initiative (TEI) is a major international project, sponsored jointly by the Association for Computers and the Humanities (ACH), the Association for Computational Linguistics (ACL), and the Association for Literary and Linguistic Computing (ALLC). Its task is to develop and disseminate a guidelines for the interchange of machine-readable texts among researchers, and to make recommendations for the encoding of new texts. Funding of approximately \$1,000,000 has been provided by the US National Endowment for the Humanities, DG XIII of the Commission of the European Communities and the Andrew W. Mellon Foundation. The TEI has also received substantial indirect support from the host institutions of participants in the project.'

TLTP

This initiative is in its early stages. There will be expertise gained which is relevant. Any strategic directions decided by the Committee could usefully be passed on to the projects. Many of their outputs will be available online and it would be useful for strategies for storage, exchange and access could be consistent with decisions made elsewhere *e.g.* in Library Review.

CALS and other industry and academic initiatives

There are a lot of people out there in industry looking at electronic documentation/information. Some that might not be so familiar are:

CALS

The Computer-aided Acquisitions and Logistics Support Programme of the US Department of defence. This has a European group EURO-CALS. The programme is concerned with turning the vast amounts of paper documentation on equipment into online material to that, for example a battleship can have an on-ship computer rather than enough paper to sink it! This has been going some years with the standards: IGES (for CAD information), SGML (documents), CGM (Computer Graphics Metafile for pictures), group 4 fax (for images) being adopted. There is a lot of use of this specification.

Publishers

Lots of publishers are getting involved. I assume the committee is likely to be fully briefed on these (Elsevier, Blackwells, Inst Physics, Springer, ACM -is this one known about, I do have some information).

Computer Graphics Suppliers Association

The UK CGSA have set up a document imaging group. They represent a large number of commercial suppliers, are a well run professional organisation for the industry and may be a useful link into suppliers.

Exhibitions

I have information from the Online Exhibition and the Image Processing Show which had a large document imaging stream.

Document Delivery Services/Experiments

I assume the following are known about: CARL; CORE; ACS/PODA project at UCL; work by Cliff McKnight at Loughborough - BL project plus paper from European Serials Conference Sept 92; I have an article on Bodleian Library; article on MCC and CURL. Do you know about Northern Telecom's CD-ROM information stored as graphical files in CGM format?

Electronic books

Tony Feldman

Strategic consultant in electronic media publishing

This working paper has been commissioned to aid discussion and analysis of the impact of electronic book technologies and media on the UK Higher Education sector in the mid to late 1990s.

The definition of the term 'electronic book' in the context of this paper, requires some clarification. At its simplest and most direct, the term applies to the increasing range of palmtop electronic information devices which are increasingly combining the benefits of electronic information and access to large databases, with the convenience and portability of the printed word. At a more complex level, the term can also be understood to refer to the use of book metaphors and the creative adaptation and re-interpretation of book-like information in new interactive formats. While concentrating largely on the evolution of palmtop electronic media and their implications in Higher Education, the paper will also touch upon the more general issue of electronic book design in media development across a range of delivery platforms.

The main substance of the paper will review the emergence of electronic book systems in the context of electronic media more generally, briefly describing the underlying technologies, the key platforms, the publishing activity which is arising to support them and the likely pace and direction of future development.

It will consider, in particular, the potential impacts of electronic book media on learning support in higher education over at least the next five years, consider implications for content provision (including copyright issues) for such support and whether it might be appropriate to create funding or other mechanisms to help stimulate commercial publishing responses to meet the needs of students and address the objectives of Higher Education during a period of budgetary restraint combined with substantial growth in student numbers. It will also place these issues in the context of an information environment increasingly dominated by the rapid rise and growth in broadband networking, a phenomenon which will have powerful and pervasive impacts on all sectors of the academic and professional community.

This paper is intended to provide a brief overview and to raise key issues rather than to provide an in-depth analysis. It is therefore discursive and qualitative in much of its treatment and designed to stimulate and focus further consideration.

The rise of the electronic information industry

Electronic book development cannot be assessed in isolation from the broader context of global growth in the market for electronic information. Fuelled by rapid development and innovation in underlying computer-based technologies, the rise of substantial new information publishing sectors suggests much more than technological revolution. Commercial activity is succeeding because the continuing emergence of enabling technologies has now been joined by an increasing understanding and cultural acceptance by information users of the unique and powerful benefits of electronic media.

To gain some sense of the magnitude of the electronic information industry, it is helpful to reflect on figures published by the US Department of Trade and Commerce in its regular 'Industrial Outlook' publication. An analysis of the US information market place published two years ago suggests that if the rates of growth of the different media sectors remain unchanged, the electronic information market in the United States would be worth more than the book market by 1997. A similar analysis for Europe suggests the cross over will take place at around the millennium. We are considering here the value of published information. If we additionally take into account the value of the vast number of commercial transactions now based on the exchange of electronic data, the electronic sector is already worth vastly more than all the sources of print-on-paper revenues put together.

It is possible to argue about the underlying assumption that relative growth rates will remain static but the broad implication of these figures is remarkable and represents a potent symbol of irreversible, fundamental change for the whole community of information providers and users. The psychological impact on traditional publishers, in particular, is already leading to strategic reassessments of long term future business development among all the major houses of Europe.

How big is the current electronic information market place? The commercial online database industry is probably worth about £8 billion worldwide and is by far the biggest sector. Over 85 per cent of this revenue is generated by real-time financial information services vital to the world's equity, commodity and currency markets. But this still leaves more than £1 billion generated by historic information of the kind routinely used by academics and professionals. The online industry remains by far the biggest sector but compact disc (CD) information markets are growing rapidly in all applications sectors and some forecasts suggest they will be worth more than £1 billion within four years. In addition, the rise of supercomputing broadband networks serving the needs of academic and professional communities worldwide may well become a major new commercial sector, depending upon the role traditional publishers choose (or are allowed) to play in the development of networked products and services.

There are other currently smaller, markets such as videotex, audiotex, fax-based publishing and exotic hybrids combining ingredients of different sectors (most obviously, integrated audiotex/fax services, increasingly referred to as 'audiofax'). Detailed analysis of these is beyond the scope of this paper. However, the message is clear. Electronic media across a range of proprietary and generic platforms are transforming the structure of the information market

place and the everyday practices and expectations of information users. Hardware, software and telecommunications companies, together with major content providers and publishers, are finding their interests converging. Many are already working together to exploit a rich variety of strategic alliances and partnerships, to build innovative new products and services and to secure opportunities for investment in a new generation of publishing activity. The process of transformation is no less significant for users who are discovering powerful new utilities capable of transforming the scope and efficiency of their traditional information practices.

The emergence of the electronic book

Book metaphors in electronic media

There is an important sense in which the electronic book is as old as electronic information. Almost as soon as affordable computer systems appeared, software specialists and content providers began to try to make them do more than merely process data. A new generation of interactive information products began to emerge, based on the concept of capturing information digitally and by using the unique qualities of the electronic format, adding value to it.

In the early 1980s, for example, when desktop and home computing enjoyed spectacular growth, many UK educational publishers invested heavily in developing computer software for use in both home and school. While some products were developed from scratch specially for the new markets others were based on existing publications and re-interpreted as interactive versions of the original linear material.

By the late 1980s, the emphasis had changed -- at least so far as the electronic medium is concerned. The rise of CD information systems had given a new impetus and direction for efforts to use book metaphors in interactive media. In particular, multimedia technology -- enabling text, images and sound to be integrated within a single, digital environment -- now provided vastly more scope for adding value and enriching information.

Among the many important examples of the use of a book metaphor has been the evolution through several CD formats of US publishing giant Grolier's 'Electronic Encyclopaedia'. It first appeared in 1987 as one of the world's first consumer-oriented CD-ROM (Compact Disc Read Only Memory) titles and comprised the 9 million words of Grolier's twenty-volume American Academic Encyclopaedia on a single disc. Since then, it has been revised, upgraded and enriched by enhancing its interactive structure, adding innovative techniques to enable users to navigate the material easily and by giving an increasingly multimedia emphasis to the product's underlying design. The latest editions are available in several versions of CD-ROM, including proprietary consumer formats such as CDTV and CD-I, and embody substantial sound extracts, a wide range of still and animated images and even some full motion video.

There are many other influential examples of traditional book metaphors being creatively adapted for electronic media applications. McGraw-Hill's UK company has produced a multimedia academic encyclopaedia of mammalian biology. Dorling Kindersley have impressively reinterpreted the illustrated reference book. Broderbund Software have demonstrated

interactive, children's reading books and the Voyager Company have adapted some bestselling novels for their highly successful Expanded Book initiative.

Numerous other CD-based products have emerged based upon print-on-paper counterparts and this trend looks certain to continue in the future, particularly since increasing numbers of traditional publishers are now at last making serious strategic commitments to the new markets.

There are of course good reasons for basing interactive media development on existing books.

- The underlying material may already be held digitally as typesetting tapes or (increasingly) as a generically coded database.
- The book is a ready source of coherent, market-tested content.
- Association with such a traditional, well-established medium as the book helps to defuse consumer uncertainty about unfamiliar, technology-based media.
- Those books that have had international success confer an immediate branding on their electronic counterparts.

The key issue facing publishers trying to create successful interactive products has nothing to do with the wisdom or otherwise of using books as source materials. The benefits are obvious. The real challenge is a creative and intellectual one. How can publishers utilise the familiar metaphors of the book while adapting and enhancing the underlying content to deliver the full power and richness of an interactive electronic medium? Indeed, how far should the familiar be retained and at what point should new paradigms be sought?

These are complex questions and for our present purposes we need only note that they are increasingly being asked in the context of electronic book development in its broadest sense. The success with which publishers address these questions may have profound implications for the future of interactive media and for the processes of change now under way in the information community fuelled by electronic media development. It is, perhaps, hard to see how interactive media can become an established part of the fabric of our information culture until users are able to regard them with a same confidence and easy familiarity as the printed word while routinely enjoying their unique benefits. In other words, finding the key to effective electronic book design may be the main influence determining the long term impact of electronic media on traditional information provision and use.

Bespoke books

Although perhaps not strictly an electronic book issue within the terms of strict definition, moves towards customised, on-demand publishing particularly of educational texts is likely to have important impacts on learning support in the higher education sector within the next ten years. Although today still in their infancy, bespoke books are likely to prosper increasingly as global supernetworks become a reality. We therefore need to briefly examine current activities in this area and to assess their significance.

On-demand publishing is a generic term denoting all circumstances in which publishers create information products which do not require inventory or conventional distribution techniques and, often, where printing migrates partially or fully down a network in the direction of the information user. The idea of 'customisation' means the creation of products designed for individual customer requirements. In the context of bespoke books, this implies the customer-driven anthologizing of texts from a variety of sources and their reproduction as a new book in its own right.

Although there are a number of current initiatives in this area (*e.g.* Simon & Schuster's Ginn Press project, the US journal 'Foreign Affairs' and the Follet/BMI Systems joint venture, CAP Academic Publishing), the enterprise using the most effective electronic technology and likely to form an exemplar for the future, is McGraw-Hill's Primis project.

Primis is a joint initiative by educational publishing giant, McGraw-Hill, who provide the Primis texts and copyrights, the largest US printing corporation, R.R. Donnelley who provide on-demand printing facilities and Eastman Kodak who have developed the underlying software systems.

Since the launch of Primis in 1989, McGraw-Hill report enthusiastic customers in over 350 US colleges and universities. Course teachers are able to select sections of materials held by McGraw-Hill on a large, digitised database of course textbooks and supplemental publications, add their own sections of locally originated course material and have their personally anthologised book printed, bound and delivered in any quantity from one copy upwards, all within a matter of days.

So far, only McGraw-Hill publications are included in the database but the company is already negotiating with other publishers for rights to suitable texts to add to the Primis corpus. The system automatically logs the use of copyright information within customised products and attends to acknowledgements and fees payable to authors.

Primis is already a network application and will increasingly rely on growing network power in coming years. Currently, three university publishing centres have been established (Harvard, Ohio State and University of California at San Diego) equipped with the Primis database, software and high speed laser printing systems. Campus bookshops offer networked access to the database so teachers can select their customised requirements and their textbooks can then be manufactured on site. Longer term, such access will probably spread across the extensive broadband academic networks currently being established in the USA and elsewhere with the process of printing the bespoke texts migrating gradually to the cheapest point in the system which is increasingly likely to be the offices of the end-users themselves.

McGraw-Hill are actively seeking to license their Primis system to other publishers and anticipate the growth of a community of Primis databases supplying the international needs of the educational and academic communities. Their UK subsidiary will be launching an initiative this year while Longman are said to be about to plough their own furrow with a Primis-like system of their own.

This move towards customised on demand books clearly has serious implications for traditional structures and relationships in the publishing industry. It is probably not a course publishers

would voluntarily wish to follow. However, the fact that Primis exists and is making slow but sustained progress, is a sign that publishers are increasingly aware of the need to answer real needs in the market place.

Primis and its imitators will plainly offer substantial benefits to teachers and students in terms of traditional media delivered non-traditionally. However, to succeed long term it will need to grow in terms of both international database content and its ability to handle illustrations and colour. It will also have to remain low priced, rigorous in its treatment of copyright issues and effective in putting into the hands of users a quality product that looks and handles like a conventionally published book.

Electronic book platforms

A general context is important to any strategic assessment of the future impacts and applications of electronic media. However, leaving aside the need for the new design paradigms which we examined above, and the implications of whether or not they ever emerge, there is an immediate and practical sense in which the electronic book has already arrived. As a ingredient in the overwhelming trend towards increasingly miniaturised computing, we are seeing for the first time the emergence of powerful portable information devices, some capable of placing the content of a small library in the palm of your hand.

These systems have not emerged in isolation. They are an integral part of a major trend in computing towards smaller, cheaper, more powerful systems. Ten years ago, portable computing meant computers with carrying handles which you could just about lift off the desk. Since then, remarkable evolutionary developments in chip performance, screen technology and power management have made it possible to create affordable pocket sized computers which often pack as much punch as their bigger desktop cousins. The market penetration of these devices has been remarkable and some industry analysts predict that by 1995 more than half the computers sold worldwide will be portables. No-compromise computing on the move is now a major and structural feature of the computer market place.

The same technology that has made palmtop computing a market reality, has also made possible a new generation of electronic books. Two broad categories are emerging: devices using chips to store information and others which use compact discs. The chip-based (solid state) electronic books look much like enhanced pocket calculators and their memories are either chips housed permanently inside the devices or plug-in cards which can be interchanged depending on which database you want to read.

Books on chips

The earliest initiative aimed at putting books on chips came from Langenscheidt, the world's largest publisher of bi-lingual dictionaries. It released its first German/English and German/French handheld electronic dictionaries in 1983 and was the first in the market with such products.

Perhaps more of greater strategic significance, however, has been the activities of US companies Franklin Electronic Publishers (formerly Franklin Computer) and Selectronics. Since Selectronics' activities have largely mirrored those of Franklin, we will only consider Franklin in any detail in this paper.

Franklin is best known as the pioneer of a range of innovative, high-performance chip-based handhelds aimed chiefly at linguistic applications. Although it has had a troubled history, its earliest initiatives met with immediate success. The world's first phonetic spellchecker, for example, Franklin's 'Spelling Ace', was launched in the USA in 1986 and sold nearly three million copies in two years. Franklin has since developed an impressive range of spellcheckers, dictionaries and thesauri and has recently moved into general reference publishing with electronic bibles, almanacs and encyclopaedias.

Franklin's products are based on content licensed from traditional publishers. For example, the word lists underlying its key linguistic products are licensed from Merriam Webster for the US market and from Collins for the British market. Franklin has also negotiated licenses with other British majors such as Oxford University Press and Longman.

Once digitised, Franklin uses powerful proprietary algorithms to compress the substantial data volumes sufficiently to fit on commercially available, high-capacity memory chips. In addition to the excellence both of the underlying intellectual property and the software which gives the products the functionality effectively defining their performance, a key factor in determining success is the quality of the LCD (Liquid Crystal Display) screens used to display information. Early devices inevitably used poor resolution, single line displays since these were only kind affordably available. During the past few years, however, rapid advances in LCD technology and power management have meant that recent Franklin products have increasingly incorporated large panel, multi-line displays, some with optional backlighting for maximum legibility.

Dramatic strides in chip technology have, of course, also transformed the potential of this type of electronic book. Using state-of-the-art chips only just becoming available in commercial volumes, Franklin have recently taken a new direction in their publishing activity. They have just launched the DBS (Digital Book System) which is remarkable both because it puts up to 90 megabytes of data (roughly, 25000 pages) into the palm of your hand and because it is a generic system. This means that unlike earlier devices, the DBS is not dedicated to the content it carries. By plugging in different memory cards, users can access different datasets. In other words, the DBS is a true publishing platform. As far as users are concerned, the palmtop device is effectively an electronic book **reader** while the individual memory cards sold separately represent the available library of electronic books.

Franklin have already announced a range of professional and consumer DBS titles and are releasing development tools to encourage third party publishing activity for the DBS platform.

Franklin's activities are, of course, based entirely on proprietary technology. However, generic world standards are now emerging for memory cards which will mean that information published in this form will be increasingly accessible across a range of portable computer platforms. The most important is the standard established by the Personal Computer Memory Card International Association (PCMCIA). It is widely expected that this will be universally

adopted by the PC industry for the burgeoning laptop, notebook and pocket computer sector, to replace bulky floppy disc storage.

Books on compact discs

In the ten years since CD audio was launched, the compact disc itself has become a major world standard for the storage of read-only information. The initial attraction of CD-ROM was its potentially huge storage capacity for text. In principle, more than 250,000 pages could be stored and then, using appropriate software, searched and accessed in seconds. Today, the sheer capacity is less important than the international standardisation of the medium and the rise of refinements which have made it possible to produce CD-ROMs containing highly featured interactive multimedia -- seamlessly integrated text, sound and images of all kinds including video.

The general trend in computing towards portability touches CD technology as much as it does solid state storage. As long ago as 1990, Sony launched the Data Discman, the world's first all-in-one, palmtop CD-ROM player. As well as creating their own proprietary version, they licensed the technology to sixteen other hardware companies some of whom have already launched their own players. In a shrewd effort to hijack a highly marketable branding, Sony have chosen the 'Electronic Book Player' as the generic name for the growing range of palmtop CD devices and have dubbed their proprietary data format for the 8-cm CDs which run on the players, the Electronic Book format.

Today, the Data Discman is available in various models in all major international markets and is widely supported by traditional publishers. Indeed, the ready enthusiasm with which publishers have welcomed the new platform is in sharp contrast to its immediate appeal as a publishing medium. Despite reasonable commercial success, the earliest players have suffered from screens that are difficult to read except under optimum lighting condition (a rather crucial problem for anything purporting to be a kind of book!), limited search and retrieval facilities, only modest multimedia capabilities and (for the consumer market) prices that have been simply too high for volume sale.

One reason why so many publishers have rushed to transfer their existing books on to the new Sony CD format is simple and practical. It is the first electronic medium to appear with an investment entry level for information providers potentially in the low thousands of pounds. For several reasons, including the lack of multimedia, ease of authoring and the smaller capacity than full-sized CDs, Sony Electronic Book titles are cheap and quick to produce. For many publishers, therefore, it has been a chance to get involved and be seen to get involved, in electronic initiatives that carry little serious commercial risk. The result, of course, has been a large number of titles exactly paralleling print publications and with comparatively little added value.

Currently, therefore, the technology is largely disappointing, publishers are rushing to support it for no very good strategic reasons and high prices are ensuring that relatively few people are actually buying systems or titles. This is a discouraging catalogue and, taken on its own, grossly misleading.

In reality, the Electronic Book platform has enormous strategic importance for all sectors of the information industry. The reason lies in its evolutionary character. We are already seeing enhanced versions of the early players emerging sporting better screens, faster processors, increased functionalities and more competitive prices. Sony maintain that this process of evolution is based fundamentally on maintaining underlying technical data standards so that all Electronic Book CDs will play on all players -- past, present and future. We must therefore not see the current generation of players as destinations in themselves but look upon them as ports of call on the way towards some hitherto unspecified, multi-functional proprietary CD information system.

Proprietary is a key word here because there is a similar but much broader generic process of evolution at work of which Sony's technology is only a part. We are beginning to see the emergence of multi-functional computing devices that combine the function of the electronic book with a range of other important information utilities.

The electronic Filofax

The rise of highly portable computing is not just another technological cleverness. It reflects a fundamental shift in the culture of information practice which insists on being able to enjoy global mobility without compromising access to powerful information facilities. The dramatic and accelerating growth of networking is also partly a reflection of an underlying desire for location and physical distances simply not to count in terms of information applications.

Portable computing, therefore, is also at the heart of a process of evolution but one that is more profound than any single line of proprietary development. The evolution of the Data Discman in all its variations into an ever more functional and attractive device is just a single strand in a much bigger fabric of development and change. Notebook and palmtop computers at the most general level are becoming increasingly redefined so that traditional computing is but one of their essential functionalities.

Perhaps the most obvious indicator of this evolutionary path is the Apple initiative to create a new generation of devices known as Personal Digital Assistants (PDAs). These devices, which will probably utilise multimedia CD technology, aim to merge computing, electronic books and communications using a variety of admixtures and price points to reflect a range of market requirements. Most significantly, PDA development is sited within a new division of Apple called Personal Interactive Electronics (PIE), an indicator that PDAs are themselves set within a potentially even broader category of computer development.

Apple's PDA initiative is just the highly visible tip of an iceberg. IBM, Sharp, EO, Hewlett Packard, Matsushita, Sony (who, in addition to the Electronic Book player, have already produced a palmtop multimedia full-size CD player) and many others, are also making strategic moves in the same general direction. What we are witnessing is the gradual emergence of a kind of highly featured electronic Filofax -- a portable device which combines the functions of computer, personal organiser, notebook, fax, mobile phone, network terminal and electronic book. Specific developments we have reviewed in chip-based and CD-based electronic books need, therefore, to be seen against this more general and pervasive process of change.

Impacts in higher education

Electronic books and the network context

In a working paper about electronic book developments it may seem perverse in considering impacts on HE to emphasise networks. It is clear, however, that one of the great themes in the information environment of late 1990s and the early years of the next century will be the immediate implications of supernetworks on all aspects of information provision, access and application. The earliest impacts are already beginning to be felt in the academic community but by the millennium at the latest, networks will also be significant in corporate, educational, professional and consumer sectors.

It is therefore impossible to assess electronic books other than in the context of the growth of global networks. They may of course continue to have substantial off-line, stand-alone value but the heart of their strategic significance will lie in their capacity to integrate with network environments and the fabric of networked information provision of all kinds.

The rise of the networks

The use of networks by the academic community is now set for dramatic growth in terms of both the scale and range of use. A detailed assessment is beyond the scope of this paper but it is proper to emphasise that the impact of high-performance networks will be the single most important influence affecting information applications in the academic and higher education sector in the mid-1990s and beyond.

It is worthwhile reminding ourselves how great the leap in network performance is likely to be. Comparing today's ISDN (Integrated Services Digital Networks) services to the coming generation of broadband ISDN networks is equivalent to likening a narrow footpath to a vast, multi-lane highway. In terms of speed of data transfer alone the differences are startling. A file of 100 megabytes, for example, would take about 800 seconds to transmit over ISDN. Using B-ISDN (based on the speed of the US NREN network), the transmission time drops to just under a second! This means that the content of small libraries of books could be transferred in seconds and, probably more significant, allows the practical possibility of delivering or exchanging extensive bodies of interactive multimedia information.

This level of network performance as epitomised by the NREN initiatives in the United States, SuperJANET in the UK and other ISDN academic networks in Europe (such as SURFnet in the Netherlands, IRIS in Spain, SWITCH in Switzerland, DFN in Germany *etc.*) all moving in the same direction, is likely to have profound impacts on the community of information users in all academic institutions. But performance has to be matched by content and applications development and the nature of the future impact will be determined by the outcome of a complex interplay of commercial and political interests.

Initial evidence suggests a move towards applications being increasingly created by users rather than publishers. The growth of bulletin boards and proto-electronic journals is already

being used as an argument for the long term redundancy of conventional publishers. While many publishers understandably resist this view, the fact that the academic community is in some cases beginning to control the complete cycle of network publishing means that journals and textbook publishers, in particular, need to reassess the particular added values they bring to the publishing process and, as a result, may have to redefine their role in it.

Impacts of networks on higher education

It is already clear that the benefits of the networked environment in the academic sector can potentially benefit teachers and students as much as researchers. NREN and SuperJANET will have little difficulty in moving teaching materials -- even those based on interactive multimedia -- from one end of the network to the other so we are quite clearly entering into a wholly different age of publishing interaction with the student -- at least, so long as the commercial, political and educational will exists to make it happen.

Within a 'wired campus' scenario with widespread student and staff access to the feeder network, the student view of the network's functionality will be of a fast-moving environment which provides a wide range of campus services plus the rapid acquisition, exchange and sharing of both courseware and reference-based learning materials.

There are many issues involved in this broad picture of development in learning support but for our purposes it is important only to emphasise the ease with which such scenarios might emerge, their potential in terms of cost-effective development of learning support facilities for rising numbers of geographically dispersed students and the facility they might offer not only for conventional information publishing or library research activity but the delivery of a new generation of powerful interactive multimedia schemes which could push the processes of higher education in wholly new directions and perhaps even transform the outcomes and economics of higher education provision.

The role of the electronic book

What relevance might the electronic book have in this process of profound evolutionary change? In terms of the electronic book concept as reflected in the design of underlying media, there is no doubt that the traditional publishing community has powerful skills and resources to deploy both in creating a new generation of interactive learning support materials and in adapting existing resources to suit interactive and multimedia formats. They have unmatched experience in orchestrating diverse expertise, matching content and structure to market need, protecting quality in design and manufacture and in marketing materials effectively and widely to ensure commercial returns and thus continuing investment and an ongoing programme of publishing activity.

So far as the palmtop technologies themselves are concerned, it is easy to see how electronic books might be used routinely as both stand alone platforms for 'off-line' use and as convenient, potentially low cost terminals to give access to the network. This suggests applications in which learning support might take place live and online and also 'off line' with the underlying materials downloaded to the portable device.

Portability is a particularly compelling quality in this scenario because it suggests that users can both study and access support from almost any geographical location at any time. This means of course that learning support can be gained at a time and place not only to suit the student but in a way that allows the education establishment to optimise such matters as the role of distance learning strategies, the physical structure of HE sites and the provision of library facilities and the time and numbers of teaching staff.

The role of publishers

We have already noted some of the strengths of the publishing community. We should also bear in mind their position over the preservation of copyright protection. Although the issues are profoundly arguable, publishers have traditionally been important bastions in preserving the integrity of intellectual property, even at a time when technology is rapidly changing many of the underlying issues.

In the electronic publishing environment where tracking proprietary data after it is delivered is often difficult, where copying and recompilation is otherwise a normal and easy process, and where many different data ownerships in a single (especially multimedia) document can make proprietary identifications complex, copyright protection is not simply just a question of principle but a challenging technical and legal issue.

Currently, draft directives from the European Commission seem sure to amend the laws controlling intellectual property in this country so far as electronic media are concerned. The details of legislative control of electronic information remain far from clear at present but one thing is sure. Publishers, while sensitive to the needs of information users in a changing world of technology, are committed to resisting the erosion of copyright and will wish to be active players in new information markets to ensure that copyrights are treated with integrity despite the increasing ease with which they can be abused.

If a view is taken that publishers are a good thing for the provision of electronic forms of Higher Education learning support, should mechanisms be considered to encourage their future involvement? Steps that distort the underlying realities of the commercial market would be both unwelcome and ultimately futile. In other words, providing subsidies to substitute for market demand, for example, or erecting artificial buffers against market economics will encourage false starts and equally false directions.

Three the areas in which we might usefully consider support are these:

- in the fostering of appropriate emphasises within SuperJANET (and other networking) initiatives;
- in the stimulation of an installed base of users in HE, perhaps by making large numbers of palmtop systems available to them;
- given the new network environment, in the orchestration of pilot programmes to define learning support needs across a range of HE courses that can be fulfilled

by competitive, commercial publishing so that provision can go hand in hand with a forward-looking and expert approach to appropriate course and reference materials.

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Standards of relevance to networked library services

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Overview

This brief report will describe 'technologies and standards' which we consider to be important for emerging networked library services, and discuss some issues which need to be addressed..

At first, we present one possible view of the virtual library, and outline the services that will be required to bring it about. Subsequent sections describe these services. These sections are:

- Some policy issues
- Communications services
- Applications services
- Data interchange services
- Meta-information services
- Authentication, charging and other services.

Recommendations are presented in a concluding section.

The virtual library

We feel it is useful to describe a context for further discussion and present here a hypothetical *virtual library scenario*. This view has oriented our selection of important technologies and standards.

A library user connects to the Information Server (we use this phrase for convenience to cover the organised presentation of services, and do not suggest how it is constructed), and is authenticated. She is a lecturer preparing a course on the image of the city in modernist literature, and is looking for information on Joyce and Dublin. She selects library services and can choose from several items, say the following :

- Books
- Journals and magazines
- Newspapers
- Reference works
- Selected image resources
- Resource guide

She has a number of requirements, say the following :

- She wants to find a specific book. She is told that it is in stock but it not currently available. Nor is it in any of the three adjacent libraries which, together with her own, form a resource sharing consortium, but it can be got from the British Library. She is offered a choice of reserving the local copy, or of requesting a British Library copy, the cost being met from her departmental ILL account.
- She does several searches on appropriate abstracting and indexing services and accumulates a list of interesting references. Two are flagged as being available in the local collection; one as being available from the *electronic library* being developed by the consortium. She elects to look at the first page of the latter, and finding it relevant, is prompted to input the name of a printer. She is interested in some of the other articles and selects the 'document request' option. The system then flags three articles as being available from the adjacent libraries, and a further two from the British Library. She chooses one available from the BL and a number of delivery options with associated costs is presented. She decides on immediate delivery and enters a credit card number. She again enters the name of the printer to which the article will be routed from the institutional document server which handles all incoming documents. She is told the article has been queued for delivery, and she knows it will be available for collection within the hour.
- She would like to retrieve some pictures also, but is not sure where to look. She switches to the Resource Guide service and does a search, limiting it to image based resources. A number of suggestions are made, including several US-based resources. She notices a hypermedia service based on the Beckett archive at Reading University, and The National Library of Ireland's Lawrence collection of photographs accessible at De Montfort University (these resources now exist, but not in this way and the latter not at that site). She selects to look at the latter, and searches for images of Dublin in the early years of the century. She browses ASCII representations of some, and selects two for delivery to her workstation as images.

This scenario involves communications between systems over a wide area, but the end-user sees services as an extension to her desktop, and uses them by simple on-screen selections and manipulations. Facilities for identification of resources, searching and browsing, locating, requesting and using information resources are brought into a single context of use, which hides the underlying complexity of the interacting systems of service provision. The technical and organisational challenges of realising such a scenario on a widespread basis are considerable. Existing library services are poorly integrated with the network, and there are few real distributed applications. The network is used to connect terminals (people) to remote resources; information is downloaded and uploaded rather than being shared between

applications. The above scenario (or others like it) will depend on a move to a more distributed environment, based on client-server operations and computer to computer communication between applications.

Services are required which allow the lecturer to search a CD-ROM and an OPAC without switching between terminals, user interfaces and command languages. Services will be required which build on flows of data. For example, a structured record is returned in response to our lecturer's search for a book. The system could take this record, and use it to search other systems (consortium libraries, BLDSC files) to ascertain location, and could then use the record as the basis for the ILL request message. The BL receiving system could use the record to search its system and notify the requester of availability. In this way the need for manual intervention, and multiple transcriptions and rekeyings will gradually be reduced. Services will be built on the basis of the routine exchange of page image and structured documents between libraries, between libraries and publishers, and between libraries, publishers and document suppliers.

These requirements are now being addressed; a variety of customised solutions are being put in place. But this will limit the flexibility and sharability of future solutions. An open architecture with standard communications, applications and data interchange services will facilitate the interaction between system components, and the extension and addition of services, minimising the need for extensive preliminary agreements or contrivance. Without such infrastructure, it will become increasingly difficult to use multiplying, diverse network resources. It is important to ensure that current technical choices do not unnecessarily constrain future cooperative or information service activities, and that these services can be put together in a variety of ways to create a variety of future scenarios.

The following services will be required to construct the virtual library:

Communications services

- Connectivity, gateway and relay services, and communications infrastructure (e-mail, file transfer, *etc.*) that will provide the basis for other services.

Application services

- Information retrieval services (transparent user access to diverse resources, and communication between database applications, as, for example, where one system interrogates another to establish local holdings).
- Request services (standard ways managing request transactions).
- Electronic Data Interchange (communication of trade data).
- Remote database access (communication between library housekeeping systems).

Data interchange services

- Applications will need a common understanding of the representation of the information objects they exchange. Libraries are beginning to exchange scanned page images, but the exchange of structured documents and multimedia and hypermedia objects will become increasingly important.

Meta-information services

- Services which assist in the identification and use of other services.

Authentication, charging and related services

- These are included for completeness, but are not treated in detail.

Some policy issues

The scenario presented above is rather easier to describe than it will be to implement. The reasons are partly to do with the technology itself and partly to do with what might be called 'political' issues. Of these, the technology is likely to be the easier one to solve.

Central to the problem is the need for different networks to be able to communicate. Our scenario might be taken to assume that the various information services interrogated by the lecturer are on the same network, but this is unlikely to be the case. The respective networks must therefore be able to interconnect. This may be difficult if they use different protocols to communicate, different forms of email to transmit document requests or other different approaches. Nor is there any realistic prospect of this changing in the short term. For this reason, 'relays', 'gateways' and 'translators' are likely to be of considerable importance in ensuring the seamless interconnection of future information services.

At a different level are the political problems. These largely reduce to the question of "who pays?". Services on JANET are restricted to those within the academic community because that is the group for which the funding was designated. Acceptable use policies permit non-academic (*e.g.* British Library) and even commercial organisations (*e.g.* Glaxo Research) to link to the network only if there is significant benefit to the academic community. Few at present do so -- at least at the direct network level rather than via an electronic mail gateway or relay.

In the United States, the commercial Internet has shown explosive growth. Because it is essentially all part of the same network, even if funded in a different way, connectivity between commercial and academic sectors is much more complete and there are fewer technical problems to intercommunication. In the UK, JANET has no equivalent commercial counterpart, which would give commercial providers unrestricted network services as well as full connectivity to the academic community.

Enabling the unrestricted flow of information between different technology domains and between different economic or resource centres are the two main policy issues.

Communications services

Connectivity and protocol issues

Introduction

In its most basic sense the network provides the connection between the customer and the information service. What kind of network is most appropriate will depend on who the customer is and what kind of service they require -- students working from home will have different requirements from laboratory-based researchers.

Our present academic networks, including JANET, do not necessarily form the ideal model for how future networks should be organised. For one thing, access is very uneven. It is much easier to gain access if you are a laboratory-based research scientist than an arts student working from home.

Nor is the physical form of networks immutable. We have become accustomed to the idea that our institutions should provide connectivity either by departmental LANs and desktop workstations, or rooms filled with personal computers for student use. However, the rapid growth of the laptop computer threatens to make both models obsolete. What users may want in future is simply a point into which they can plug their personal laptop, whether in the library, at home, in the laboratory or in the office.

At the same time, it is not clear that information providers will necessarily want or be able to deliver services to customers through our present networks. Some providers may not want to invest in a connection which allows them to communicate with only a part of their customer base. Uncertainty about future network funding and acceptable use policies is also an inhibitor. Despite BIDS and other important initiatives, the network is still relatively 'information poor' when the range of potential user requirements is considered -- a library with a good collection of CD-ROMs may well be able to offer a greater resource of information than the whole JANET network. It remains to be seen what information services develop on JANET. Various 'host' or 'brokerage' services may emerge which resell information services to the academic community, other commercial providers may connect, and services will be provided from within the academic community itself. However, the network will also become important as a gateway to resources on other networks, including commercial networks. The full resources of the global Internet are now accessible via JIPS (JANET IP Service). This more than anything has opened the network to a much wider range of information resources.

Protocol issues

At the lowest layers, network technology for LANs has settled to a very limited number of different options, primarily ethernet and token ring. Above this level, however, choices are more diverse though within the UK academic community the dominant ones would be TCP/IP, OSI and Novell's IPX (plus Appletalk and DEC's LAT). In principle, all three protocols may be run over the same network; in practice, however, this may prove difficult and will certainly increase the problems of network management. Individual departments will then make a choice as to which network type is most appropriate to their own needs -- science/engineering

generally opting for TCP/IP and arts/laws for Novell, with a minority choosing OSI, Appletalk, or LAT. One factor influencing the choice, particularly in libraries, has been the growth of CD-ROM usage and the requirement to make network access to these available -- the majority of these are designed for PCs on Novell networks.

The present strategy for providing wide area access is to link departmental LANs into a campus hub. These in turn will connect to one of the regional X.25 switches of the JANET backbone. In this way, higher level services such as email and file transfer can be set up between remote sites.

Alternatives would be to link the LANs using the TCP/IP protocol itself. This is broadly the basis on which the Internet is organised (*i.e.* it does not use X.25 and is therefore non-OSI in the strict sense). Novell's own protocol (IPX) is generally considered to be unsuitable for wide area connections, and in this case a relay facility to convert to TCP/IP or X.25 might be included in the network server.

Current UK developments

Installation of the academic network JANET predated publication of the OSI standards. For this reason it was forced to develop its own version of OSI -- the so-called 'coloured book' protocols. Although these are still widely used on JANET, there is virtually no use outside this community. It was always intended that these would be a transitional device prior to full implementation of OSI. A number of factors have conspired against this, however, with the result that the transition is still far from complete.

Perhaps chief among these inhibiting factors has been the demand from users for access to (and from) TCP/IP networks such as the Internet. This led the JNT to implement JIPS (JANET IP Service). Direct demand for OSI, on the other hand, has probably been minimal.

More recently, a different group of users (frequently arts, libraries or administration based) have adopted PC LANs using Novell's Netware network operating system. This has further eroded support at the LAN level for OSI.

The result of these divergent tendencies has been to distract effort and resources away from full conversion to OSI. At present the most significant initiatives have been directed at implementing X.400 email and X.500 directory services, though even here the level of adoption has been patchy.

Away from the academic sector, the growth of commercial Internet is perhaps the most significant event in the inter-networking area. In the UK, two companies are providing commercial access (Pipex and GBNet), with links into JANET, US Internet and EBONE (a European IP backbone). TCP/IP is again the protocol used for commercial Internet. The Internet is now composed of networks with various funding patterns, with different mixes of public and private funding.

In the commercial world, Novell now has something like 75% of the PC LAN market. Product availability, easy access to support services and low cost give this area considerable

momentum. In the short term, competition between Microsoft and Novell is likely to drive this market.

As network technology becomes mature, it no longer makes much sense for the academic sector to attempt to lead the market in the way that it did (or tried to do) ten years ago. Networks based on current technology are now commodity items rather than high-value research tools. This is reflected in the much lower prices now operating, particularly for PC LANs.

Future directions

Among the principal future directions is the trend towards much faster networks, both local (100 M bps ethernet and FDDI) and wide area (Frame Relay, SMDS and ATM). Emerging products in this area are tending to adopt the TCP/IP protocol (or its extensions) as a basic standard, though the situation is still somewhat fluid.

At the same time, the growing complexity of the current generation of networks (particularly the need to run a multiplicity of protocols and relays) is creating a significant problem in network management.

In the light of both these trends there may be a need to re-evaluate our strategies for network specification, and particularly the choice of which protocols to support. The cost of supporting multiple protocols can be considerable. There is as yet no sign of fundamental change on access policies. At a technology level the assumption is still the conventional model of LAN plus workstation. Future users, however, will want to plug in their laptops or connect in through ISDN, but facilities to enable this are as yet poorly developed. At the same time, the range of information providers with access to the network will need to increase. In both cases, the best strategy may be by provision of adequate gateways or relays, at various levels, rather than by direct connection.

Gateway and relay services

Introduction

Interconnecting between different networks requires gateways and relays. The demand for wider access has created a market for specialist services providing interconnection facilities. In the last few years cooperative organisations such as RARE and COSINE have emerged to fill this need. A desirable service of any network provider, commercial or academic, is to allow their users to benefit from the services of other networks, whether or not they are a part of the global Internet.

Even if the networks employ the same technology (X.25 or TCP/IP, say) then some mechanism is needed for them to interconnect. Higher up the protocol chain, ways must be found for file transfer across networks, or for the interchange of email. More complex still is the provision of some way by which users of one network might be informed of resources (including other users) available on another. Directory services fill this role.

Current UK activities

One of the earliest forms of interconnection between networks was by means of the email relay. These, for example, enabled messages to be exchanged between the three different domains of JANET, Internet and Usenet (the Unix network). Each domain employed very different protocol and organisational structures, making data transfer between them very difficult. The initial method was to dedicate a particular machine to act as a converter. Sitting on the two networks it would translate address formats or other data and forward the message on. In the UK, such converters still form an important link in the communications chain.

More recent developments have concentrated on the use of international standards as common conversion protocols. X.400, for example, is emerging in this role. Email from proprietary systems (such as cc:Mail) or from non-standard 'open' systems (such as JANET's 'Grey Book' or Internet's 'SMTP') may be exchanged by each converting first to an X.400 format. A similar approach may be taken with file transfer, using the OSI FTAM protocol to convert between JANET 'Blue Book' and Internet 'ftp'. Initiatives to develop such gateways have been mounted by the JNT and early versions are now in operation on the network. In spite of this, it is likely that demand for direct access to 'ftp' will undermine this approach. It is generally reckoned that in the near term over 75% of all traffic on JANET will be IP-based, for which ftp is the normal file transfer protocol.

This is the fundamental predicament: whether to provide conversion facilities or whether to simply adopt the whole protocol. It is not clear how things will go in the long term, though it is likely that the need for both approaches will always remain. The case for email conversion is perhaps stronger, possibly because of its 'store-and-forward' nature, which means that the user is only aware of it as a local operation (unlike file transfer or remote access).

The interconnection of different organisational or administrative domains might also be thought of as a function of general gateway services. In the UK, for example, a link between Pipex Ltd and JANET provides one gateway between the commercial Internet and JANET. A similar service for both Usenet and Internet is provided by GBNet, based in Canterbury. Commercial Internet services such as those offered by Pipex and GBNet have a rapidly growing customer base that includes many of the UK's leading technology companies, as well as organisations such as the British Library who are interested in marketing information services to such groups. As in the 'academic' or publicly funded sectors of the Internet, there is no usage charge, but an annual fee of £6,000 to £10,000 for a 64 K bps link. (This is somewhat less, in fact, than the current price charged by JANET for an equivalent JIPS connection). If US experience is repeated in Europe, the supply of basic network services will become an increasingly competitive market.

Yet another form of 'gateway' is currently provided by dial-up access through an intermediary organisation. The Internet itself can be connected to in this way through a dial-up service offered by Demon Ltd (who, in fact, resell access to GBNet services). Access is typically at 9.6K bps via a modem and the monthly charge is around £10 (which includes an Internet email connection).

Future directions

The increasing trend towards global connectivity can only mean that the importance of gateways and relays will grow. It is probably unrealistic to see the world (or even the UK academic community) ever converting to just one protocol format -- whether TCP/IP, OSI or any other.

Enhanced dial-up access, perhaps based on ISDN, is another likely growth area that is of particular importance to the education sector. Giving full access to the Internet (and indirectly to JANET), it would be a powerful tool for independent students or small organisations. Such services are already being considered by commercial operators. JANET itself has begun to experiment with ISDN access, but no official gateways between the two networks exist at present.

A critical new development is a system which goes under the general acronym of SMDS (Switched Multimegabit Data Service) and is best thought of as being a public switched data network much like the current GNS or its forerunner PSS, but operating at much higher speeds. A major component of SuperJANET is based on a new SMDS service that is to be launched next year by British Telecom and for which the academic community is acting as a trial customer. The corresponding component of SuperJANET will simply be a 'closed user group' within the public SMDS framework. This is completely analogous to the current closed user group arrangements on GNS. This factor is important as much for political as technical reasons, though it remains to be seen what level of interconnection will be possible between SuperJANET users and other SMDS users.

SMDS has the potential to become the international public data highway of the future. It is intended to provide the equivalent of the telephone network for interconnecting computers. Anyone with an SMDS connection should, in principle, be able to connect to anyone else on the network, wherever they may be located. It has the capability to provide a much more flexible service than the earlier generation of public data network. Connection speed, for example, may be negotiated by the customer from 2M bps to 34M bps and potentially much higher. Protocols, too, will be much less restrictive. No longer will it be necessary to run only X.25 as at present but a range of options will be available, including IP direct. Unlike earlier forms of public data network, SMDS will be paid for by a monthly standing charge based on the access rate, but without a volume charge. Access rates are guaranteed and the underlying technology is specially designed to cope with the 'bursty' nature of data traffic. In this respect it is different from the telephone network where a constant bandwidth is needed for the duration of a call.

Full details of charging scales have yet to be published, but it is anticipated that SMDS will be very competitive with current leased line or GNS access. Although it is to all intents and purposes a 'public' and 'open' standard, SMDS has the virtue of being the work of a single organisation, BellCore, adopted intact as an international standard. This should give it a degree of stability and international uniformity that many other communications standards, such as ISDN, have found difficult to maintain.

At the same time, the need to link across administrative boundaries -- commercial, government or academic -- will ensure the continuing importance of commercial internetworking service providers. In particular, the role of commercial Internet is likely to increase. In the US, it is

already the fastest growing part of the Internet and threatens to become its dominant sector within a very few years.

Information suppliers as well as users, will wish to be able to communicate with the academic community. Many commercial information suppliers will use the services of commercial Internet providers to connect to their academic customers on JANET, SuperJANET or other academic networks, and to industrial and other customers on the commercial networks. In this way, they may not directly connect to the academic section of the network at all.

The future network environment will be characterised by a variety of communications services, and a variety of funding patterns for those services. There will be 'gateways' (technical, service and policy) between the publicly funded 'academic' parts of the network and the commercial parts, which determine the level and type of interconnectivity allowed. It is in the interests of the academic community to encourage such gateway services, and to foster debate about the relationship between currently private academic network services and the rapidly emerging public network infrastructure. It is a very fluid environment, and current uncertainty and lack of awareness is one of a number of factors inhibiting the development of network information services from the commercial sector.

Communications infrastructure

Introduction

Network technology is driven by the applications it may carry. With time, the level of application moves upwards. For example, at the present time email is generally considered an application. In future, however, it may simply be an infrastructure facility on which real applications might be developed (such as EDI or ILL). With emergence of such 'email-enabled' applications the level of application moves up.

A similar movement is happening at the lowest level of the network. Here it is the requirement to manage the network itself as a resource, much in the way that an earlier generation sought to manage the computer as a shared resource. The development of so-called 'network operating systems' is an important move in this direction. Current examples of this are Sun's NFS and Novell's Netware. Others will no doubt emerge, particularly within the orbit of Microsoft's Windows NT.

Much of this goes under the name of 'client-server architecture'. The basic idea being to view the network as a set of servers providing different functions (database, printers, communications gateways, *etc.*), together with a set of clients requiring those functions (generally identified with the workstation through which the user communicates). This model has become very influential in the development of the new network services, even though there is still considerable argument over its precise interpretation.

At the same time there has been a revolution in the way the user is expected to interact with the computer (or with the shadowy 'servers' in the background). The manipulation of data through 'windows' -- whether X, Microsoft, or Apple -- has become the *de facto* standard for best

practice. In a sense it marks as great a shift as that from the teletype to the vdu twenty years ago.

These basic elements -- 'windows' plus 'client-server' -- provide the framework through which individual services are delivered, and the objective is 'integration' and 'transparency'. Many things can be done through a common interface while the source of the services -- the network servers -- is transparent to the user who no longer sees a difference between local and remote.

Current UK activities

There is considerable activity in the UK directed at the use of standard communication services (X.400, X.500, ODA, SGML) for the provision of high-level applications. Among the most important are:

- The British Library's experiment in using X.400 for document delivery is an example of an email-enabled application
- The BIDS document ordering project is developing a link between an online bibliographic search facility and a document ordering system
- The directory services project being undertaken by UCL and Brunel is looking at the possible application of X.500 to document location
- A variety of electronic publishing projects (CORE, IOP) are studying ways of using the networks as a medium for interactive access to documents

One primary goal of such experiments is to integrate the many functions associated with the application through a single uniform interface, to make it appear as if it were all happening locally. For example, in the case of a document supply service, it must seek to tie together online search, document request and request monitoring, as well as document transmission and output, all under control of the end-user from the one workstation.

Future directions

There is likely to be a general growth in the use of email-enabled applications. In the context of information and library services, these will include interlibrary loan and document delivery, but may also extend to remote database search and general information retrieval. Wide area applications of this kind can be built on the basis of X.400 (though Internet may well develop its own versions based on the Internet mail protocol SMTP, coupled with the new MIME protocol, which has facilities for multimedia body parts). Local area applications will come from the commercial LAN market and are likely to be built around proprietary email protocols such as cc:Mail. In all cases, however, the availability of standard APIs (Application Programming Interfaces) will make development easier and ensure a reasonable degree of portability and compatibility.

A logical extension of email-based applications is to work-group communications, or 'computer supported collaborative work' (CSCW). This is generally viewed as one of the major new directions in which networks will develop. CSCW includes areas such as collaborative authoring and multimedia conferencing. Exactly how these might tie in with information services is as yet poorly understood.

In all these future developments the increasing impact of Internet will be a major influencing factor. As with the Z39.50 protocol, it is likely that initial implementations will be available first on TCP/IP. Maintaining compatibility with an OSI environment will be difficult. One hope is that the availability of X.400 over IP (and its increasing use as a common conversion protocol) might encourage its use in the development of email enabled applications.

Application services

Information retrieval services

Information Retrieval and SR/Z39.50

Search and Retrieve (ISO 10162/3) and Z39.50 are emerging as protocols of choice for the construction of distributed information resources. (Z39.50 is a NISO standard which is a superset of SR). These resources may be online catalogues, other bibliographic services, or, in theory, a range of other resources. The protocol has facilities for managing the queries and returning results. It also includes a mechanism for switching between query languages, allowing a single user interface to access multiple servers, and, similarly, a single server to be accessed by multiple interfaces. This technology is strategically important for at least two reasons:

- End-users cannot effectively use endlessly proliferating different user interfaces. SR/Z39.50 does not prescribe a standard user interface; it offers a standard way for a particular interface to communicate with servers. The interface may be implemented in association with a standalone client, or may be part of an existing product, such as an OPAC. This is the type of application that is currently doing most to drive SR/Z39.50 development.
- It will support communication between applications. Examples of such links are between a union catalogue and circulation systems to determine availability, or between a search system and local holdings files. Links such as these would be used to flag locations in the scenario presented above. SR/Z39.50 has not yet been widely implemented in this context, and certain required services are lacking from it. One example is the link between Melvyl, the University of California Union Catalogue, and the circulation system of UC Davis, so that Melvyl can determine the status of Davis items on behalf of the user.

Current activities

There is a vigorous group of implementors in North America who cooperate informally in the ZIG (Z39.50 Implementors' Group). Developers include the Library of Congress, the National Library of Canada, the Universities of California and Pennsylvania State, Carnegie Mellon, OCLC, RLG, Mead Data Central, NOTIS, DRA and others. In Europe the principal implementors are Pica and LASER within Project ION, and the Nordic academic union catalogue organisations (LIBRIS, BIBSYS, ALBA, LINNEA) who are participating in Nordic SR-Net to link their systems. There are other initiatives in Germany and Denmark.

The UK academic community has lagged behind the US and the Nordic countries, and has little input into SR or Z39.50 standardisation activities. Arising from a UKOLN initiative there is now a UK SR/Z39.50 Pre-implementors' Group which may cooperate in the production of a standalone PC client application subsystem. IME is involved in a CEC sponsored project with Danish partners to develop SR client software. Apart from LASER activities (and it should be noted that LASER will be strengthening its links with the academic community), the most significant development is a Telematique funded project to link university systems in Ireland. *Requests for proposals* for server systems were sent in February 1993 to vendors of the involved systems (BLCMP, DYNIX and URICA), and a standalone user application which will include a Z39.50 client subsystem is being developed by Fretwell Downing. Production services are scheduled to be in place by the end of 1993. It is interesting because it provides a concrete incentive for significant vendors in the UK market to develop Z39.50 servers (the project will implement Z39.50-1992 over TCP/IP on the Irish academic network, HEAnet). Another noteworthy initiative, still in planning, is the British Library's commitment to supply its OPAC over JANET through a Z39.50 server. DEC is participating in this work.

Future directions

Z39.50 itself is not important; the construction of distributed bibliographic systems is. Z39.50 is the current lead candidate for the construction of many of these applications, and the future of this protocol seems assured by the adherence it has from so many important players. There are three main problems. The first is the lack of experience in support of actual distributed services. Although used to support the client-server operation of a small number of systems, routinely interoperating production services are only now being put in place. It is important that UK developers and funding bodies become aware of some of the issues of implementation, assess the suitability to their needs of SR/Z39.50 and feed back into the standardisation process. The second problem is related to this: there are very few products available which incorporate the protocol. OCLC and NOTIS market a variety of products, including client and server systems. VTLS markets a client for MS-Windows, and most other US library system vendors have or are about to offer library systems which incorporate the protocol. The Irish project mentioned above and ION may lead to further system offerings. FreeWAIS 1.0 will incorporate Z39.50-1992, providing a boost to usage on the Internet. The final problem relates to protocol differences at various levels. SR will be a compatible subset of Z39.50, though interoperating systems have yet to be developed. The protocols will be implemented over different communications services. Typical implementations are Z39.50 over TCP/IP, SR over ISODE and TCP/IP, and SR over OSI. Interoperation between these three will rely on gateway or relay services, which have yet to be developed. This complicates implementation choices. (A

project, Eurogate, now being discussed within the context of the CEC's Libraries Action Plan, may provide some solutions in this area).

Other approaches

There seem to be two other main candidates for this type of application: X.500 Directory Services, and Remote Database Access (RDA). BLRDD is funding work at Brunel and UCL into the use of X.500 for bibliographic applications. X.500 is not now being widely investigated for such services in the library community, though it may have future role in resource discovery applications. RDA is discussed further below.

Request services

Requests and the ILL standard

Items will be requested from several sources: other libraries, document suppliers, publishers, and other emerging providers. It would already be useful if there were a standard way of communicating requests, however they originate.

However, on inspection, it is clear that the request is only one part of a whole process, which will require a range of transactions. Examples are notification of ability to satisfy the request, notification of conditions under which it can be satisfied, referral of request to other suppliers with backward notification, notification of despatch, notification of receipt, cancellation of request, overdue and recall messages, status queries, and so on.

The ILL protocol (ISO 10160/1) was developed in this context. It is conceptually similar to the EDI agreements discussed below and includes provision for: definition of required data elements, definition of a set of messages and their relationships, and a syntax for structuring the messages. (This syntax is defined using ASN.1, but there is also provision for encoding using EDIFACT).

It is anticipated that the protocol will be implemented in two modes: connection-oriented (real-time interactive) and store-and-forward (electronic mail). Development has so far focused on the latter mode, as the emphasis has been on interlibrary loan. However, implementation in a real-time environment will be required if it is to support online requesting of materials with instant feedback. However, ILL is quite a complex protocol; it may be that a 'lightweight' version is more appropriate for use in interactive services, or that it is not feasible. It should be noted that the ZIG is also discussing the possibility of a document order ability being included in some way within Z39.50, maybe drawing on ILL, but this is in early stages.

Current UK activities

There is currently no standard way of requesting materials. The British Library operates the proprietary ARTTEL system. Many automated interlibrary loan systems interface to this, and

BIDS is also developing an order system which will send requests to the BL as well as, in the future, to other document suppliers. Automated request management is underdeveloped.

There is of course a range of 'request' services developed on the academic networks. These may be based on Listserv, file server or other technologies. There is no standard approach, and request management has not been a major issue.

The British Library and LASER have been involved in the development of the ILL protocol, and LASER has implemented it as part of Project ION.

Future directions

The ILL protocol has much to offer in ILL operations, especially as ILL becomes more distributed. The system to system communication of structured messages allows a greater range of ILL operations to be automated, and manual or mixed procedures for tracking, overdue, recalls and so on to be automated. There is also discussion of extending the protocol to allow the inclusion of requested documents in the 'shipped' message.

Its use in interactive services for the request of documents requires further investigation. It does seem to offer many required features, including facilities for auditing transactions. BIDS and any other bibliographic data centres should be encouraged to investigate the ILL protocol in the context of their ordering systems.

The ILL protocol has largely been looked at in Canada and Europe, and not in an Internet context. It is also quite complex, designed to handle the multiple transactions involved in complex interlibrary loan transactions. Other approaches (such as the use of extended services within Z39.50) may be more appropriate for some types of transactions, and should also be considered.

Electronic Data Interchange

EDI and EDI standards

EDI is used to refer to the computer to computer exchange of processable structured business messages. Particular 'islands of EDI activity' need to agree the elements to be included in messages, a set of messages and the business rules which govern their relationships, and a syntax which defines the structure of the messages.

There are three main syntaxes of interest here, and each has associated library activity. The ISO standard is EDIFACT, and a CEC project, EDILIBE I, has produced an EDIFACT recommendation for library oriented business message types; EDILIBE II is now implementing these agreements. X12 is a US standard, and booktrade formats have been developed by BISAC. X12 is widely used in North America, and in the serials industry. In the UK, the BEDIS formats have been implemented in a Tradacoms environment. It is anticipated that these approaches will converge.

A variety of transmission mechanisms is used for the delivery of EDI messages. An important future transport medium will be X.400, and a specialised X.400 service for EDI is being developed.

Current UK activities

The development of the BEDIS formats in the Tradacoms environment are coordinated by Book Industry Communication (BIC). These formats are beginning to be used in pilot activities involving libraries, booksellers and publishers. BLCMP, Blackwells and John Rylands University Library are collaborating in the EDILIBE II project. X12 formats are also supported.

In a recent initiative, BIC assumed secretariat responsibilities for EDITEUR, a pan-European group responsible for developing EDIFACT formats under the umbrella of the EC's TEDIS programme. The EDILIBE work will be an important component of this activity.

In an interim period the BEDIS and EDILIBE formats will be in use. BLCMP and LASER are proposing services which will accept messages from libraries, and reformat them for transmission in BEDIS or EDILIBE streams as appropriate. They will provide batching, auditing and other services.

Future directions

It seems likely that future EDI activity will be based on the formats that emerge from EDITEUR/EDILIBE activities and that any new initiatives should be based on their work. Communications services will be provided by X.400 and EDI VAN services (*e.g.* First Edition EDI services). Libraries will connect to these directly, or through other organisations as suggested above.

Library housekeeping

Some possible requirements

Library housekeeping systems have several potential interfacing requirements, including:

- to their own university personnel and/or finance systems;
- to borrower information at another university;
- to circulation systems at another university.

One can imagine several approaches:

- SR/Z39.50 or RDA (Remote Database Access ISO 9597) for interfacing to circulation systems.
- SR/Z39.50 or RDA for interfacing to borrower/finance/personnel systems.

- EDI links for transmitting personnel information between universities (apparently this is being done between Canadian universities).

RDA standardises client-server operations for database applications, and an SQL specialisation has been defined. It is not yet widely implemented and it does not include the switching facility of SR/Z39.50. The client needs to know how data is structured on server systems. It has been developed in the context of allowing existing relational databases to interoperate. If SR/Z39.50 is to be used there will need to be some work done on 'attribute sets', in which queries are expressed.

This is an area with clear potential overlap with the MAC initiative. It appears that there is no consistent approach between MAC families in terms of data definition. It also seems to be assumed that interfaces between different campus systems are to be treated as institutional issues in the first instance. A need for interoperability and sharing of information between systems at different campuses has been recognised, but no standard approach has yet been investigated.

We do not feel we can make any recommendations in this area without a better understanding of the organisational contexts in which library housekeeping systems will communicate with each other and with other systems. Nevertheless, once such contexts are clearer, a coordinated and consistent approach is desirable.

Data interchange services

Introduction

We need to address the question: what do we mean by an electronic document? Is it a reflection of what we can see on the printed page or does it contain something more?

We can recognise at least three options for storing documents which contain more than just text, for example text, graphics, layout:

- page image
- layout and content
- structured information.

We will look at each of these in turn.

Page Image

This is where we store the image of the page as it would be read. There are two main ways that this is carried out in practice.

The first way is to store a raster image, often using one of the formats defined for fax machines by CCITT. The main advantage of this is the simplicity and the fact that the output can be automatically sent to a fax machine for output. Another common approach is to use a *de facto*

standard such as TIFF. The disadvantage is that the page consists of a series of dots (and only black and white ones) at a fixed resolution. Our text and graphics information in the document has been lost. However we do have a page which can be attractively laid out and include pictures, symbols and tables. It is at a fixed, and fairly low, resolution.

The second option is to store the page using a page description language where the text and graphics are stored together with output information such as layout, font, linestyle, *etc.* The most popular format is the PostScript language which is output from very many packages and is included in firmware of output devices such as laser printers. This is not as inflexible as the raster storage in that the scale can be changed without loss of information. It is only a small advance from the fax image offering the advantages of potentially high resolution colour output - that is, it is close to being as good as our printed paper copy. (Acrobat, a new offering from Adobe based on its Portable Document Format, may also become important in this area).

The advantage of the page image solution is that there is a lot of software around which can support this as an option. This cannot be ignored.

Layout and Content

The next possibility is that of storing the layout of a document and the contents of that document separately. This is the approach taken by the Open Document Architecture (ODA) standard. In ODA the layout of the document is stored. This might include pages, title areas, places for pictures, *etc.* The standard also allows the logical structure of the document to be defined. This may be chapters, paragraphs, *etc.* which are then linked to the layout of the document. Alongside this the standard allows various content architectures to be positioned into places on the 'page' (this page could be a piece of paper or a screen and the layout may vary depending on the output medium). ODA standardises a number of content architectures. One of these is the Computer Graphics Metafile standard. Another is a raster format based on the CCITT fax standard.

Structured Information

The Standard Generalized Markup Language (SGML) provides a meta-language (syntax) for writing rigorous, descriptive definitions of documents. It is independent of any system, device, language or application and allows individuals or groups of people in user communities to write their own types of documents within a standard framework. The information may include information beyond text and this may be image data stored in fax format or may be a CGM file. This standard separates document definition from subsequent access and viewing and allows information be accessed in unpredictable ways at the time of markup.

Each SGML document contains 3 parts. The first is an SGML declaration which describes the environment in which the document needs to be processed and may include information about which character sets are to be used. The second part is the document type definition (DTD) which describes the logical model for the document and defines references to entities which may be referenced, such as a fax image or CGM file. The third part is the document stream itself.

The SGML standard has an associated standard called the Document Style Semantics and Specification Language (DSSSL) which gives rules of presentation and style for the logical document components, for example headers, footers, chapter headings, *etc.*, which are defined in the document. The document may then be output via a page description language such as PostScript.

SGML gives the most flexibility of our options. There is little restriction - too little many would argue - on the markup used. The standard is beginning to be taken on and used in publishing applications, by the US Department of Defence and by providers of some experimental online information services. It seems to be gaining momentum in the marketplace especially as the multimedia standard called HyTime, which is an SGML application, seems to be being taken up by a number of key players in the market.

Beyond ASCII Text

There is a temptation to think on online documents as simple text written in English (or American!) using only those characters which we can type on a QWERTY keyboard. If we are to seriously look at providing a range of online texts then we need to move further than this. There is a need to represent the different character sets used throughout the world. Some of these have a very large number of characters in the set. These can be stored on a computer using extended character sets but software and file formats need to be able to handle them. Most of the ISO standards have had to address these issues and allow the selection of extended character sets.

We also need to address the need for symbols, for example chemical and mathematical symbols. The detail of some of these means that the storage method is relevant - for example a raster image of a symbol at a medium resolution may not give sufficient detail to show the symbol accurately.

Viewing and Printing

The way we view documents and perhaps print them out needs to be considered. Standard interfaces for viewing (*e.g.* X Windows); standard output formats (*e.g.* PostScript) need to be established and direction given to the community. There are directions which groups such as IUSC and AGOCG have adopted which would be relevant.

Current Activities

SGML related

The SGML project at Exeter is a starting point for information on that standard and associated standards (*e.g.* HyTime) and activities. They have started an IUSC working party to evaluate SGML products. They are going to carry out an assessment of the current Document Type Definitions (DTDs) in conjunction with the Text Encoding Initiative and look at requirements.

The Institute of Physics Publishing are using SGML, and have a need to incorporate have high resolution graphics. SGML is being used in the SuperJANET demonstrator project which arose from the SuperJANET Project on Information Resources and which involves IOP and other publishers in an electronic journal testbed.

Page Description Languages

The Advisory Group On Computer Graphics has commissioned a report on PostScript previewers from Alan Francis who has done some consultancy work on documents, graphics and CGMs. NISS are using indexed PostScript files in their online information about subject areas (commences with training initiative related projects).

Graphics and on into Multimedia Contents

The Advisory Group On Computer Graphics has a lot of experience through members' contacts in the community and the Coordinator, Anne Mumford, who chairs the ISO committee of graphical file formats. The JNT are looking at multimedia contents in the SuperJANET projects.

Standards Activities

Name a standard and someone in the UK academic community is likely to be involved. Standards and portability issues have been a real concern for some time. The ISC currently subscribes to DISC and there are occasional meetings of people in the community who represent the ISC on various panels.

Scanned Documents

Scanning documents currently held on paper is being done in a number of experimental services. There needs to be agreement on the file format adopted. Fax formats are popular. TIFF is widely used. TIFF using fax compression is used by the GEDI specification which needs to be looked at if agreements on formats are sought. CARL, CORE and other projects use various formats, some with associated indexing. Current surveys suggest that second and subsequent requests for journal articles are not common. This, together with the fact that copyright laws prevent many articles being stored undermines the economic viability of electronic document delivery.

Future Directions

We will almost certainly always have information on paper. Where justified by use and legally permissible, some of this will be digitised. There is a need to have agreement on file formats and some, *e.g.* the GEDI specification, are emerging.

The main area where there is potential for online information is where it is originally created online. Theses, current journal articles, and campus information are examples. If these are to be stored online then we need to address how they are created to make their subsequent processing and access easy/easier.

Specifying appropriate software will probably come from publishers who wish to take in complex documents using, say SGML. The publishers are likely to come up with common DTDs but progress on this is slow.

One other feature which is bound to emerge (at least based on recent history of graphical file formats) is the need for translation tools from individual preferred formats to the interchange format. Work at UCL on SGML and ODA conversion tools are an example. The various graphical file format translator tools can also play a part.

Meta-information services

New automated services will provide information about information resources. As this topic is being covered in a separate submission by Jill Foster, it is not fully treated here.

Resource information

There are at least two levels of information required:

- Information which will help the user, or user agent, to locate suitable resources, to assess their relevance to particular requirements, and to determine the cost of using them;
- Addressing information, resource and service names, and other details about the technical capabilities of servers.

The former will be of assistance to users or user agents in identifying suitable resources; the latter to client systems which will be able to traverse links included in the description, where possible. Resource information will be made available in a variety of ways:

- Directory services (X.500, WHOIS++)
- Organisational 'resource databases'
- Discovery and access tools (see below)
- Other services (*e.g.* the *explain* service of Z39.50)
- 'Print' (paper, bulletin boards, ...)

Clearly, it would be of benefit if resources were described in standard ways, and if these descriptions could be accessed in standard ways, to facilitate their integration into automated services. This is now an area of much diffuse activity, and we feel that the nature of the problem needs to be better understood before any preferred solutions emerge. One significant area of activity which should be monitored is the CN1's TopNode project. Another is the work being carried out under the auspices of various IETF working groups in the area of integration of network information retrieval and resource discovery (NIRD) tools. One important strand of

this work is that on Uniform Resource Identifiers, which consist of (at least) Uniform Resource Names (persistent resource identifiers, rather like the ISBN) and Uniform Resource Locators (which specify location and method of access of a resource, rather like a shelf-mark). This work is strongly related to initiatives discussed in the next section.

Network discovery and access tools

Drawing on taxonomy developed by Peter Deutsch (a developer of Archie and Whois++), these tools can be categorised as follows:

- Access and navigation : Gopher, WorldWideWeb, Hytelnet, ...
- Indexing : WAIS, archie, ...
- Directory : X.500, WHOIS++, ...
- Distributed file systems : Prospero, Alex, Andrew, ...

As noted above, these topics are being dealt with elsewhere, however, it may be useful to note some trends and suggest how libraries might become a more integral part of the 'virtual spaces' these tools create. Some trends are:

- There will be more coordination of future developments through the joint IETF/RARE/CNI Network Information Retrieval Working Group, the IETF Integration of Internet Information Resources Working Group, and other groups.
- Gopher (or WWW) will increasingly be used to provide frontend access to the network; servers will offer customised views of resources, responsive to the needs of particular user groups. Gopher is being taken up rapidly by libraries and computer centres, and other organisations in this capacity.
- Other 'publishing' or 'directory' services will be gatewayed or backended onto this in various ways.
- A lot of work is going into the next generation of tools.
- Lack of authentication and charging mechanisms is holding up commercial providers, but once these are in place all 'tool providers' are interested in making commercial services accessible.
- WHOIS++ looks set to take off quite quickly on the Internet, competing strongly with slowly developing X.500 for directory services.
- There will be many access protocols, templates, data interchange formats.
- The effectiveness of the network discovery and access tools is limited by the underdeveloped state of resource description and classification techniques.
- These services are largely IP based, and are driving further demand for IP connectivity.
- In some cases it is not clear how services will scale up (*e.g.* one cannot browse hundreds of nested menus).

Library services are poorly integrated into this world. For example Gopher provides very low level 'access' to OPACs: it has to drop into a telnet session and pass control over to the library system. It is anticipated that Z39.50 will be the underlying 'plumbing' which allows Gopher and other systems to interface with library services more satisfactorily. WAIS clients which are compatible with Z39.50-1992 will appear later this year, and the developers of Gopher have

indicated interest in developing a Gopher to Z39.50 interface when more Z39.50 servers appear on the Internet.

Authentication and related services

Authentication, charging, security and accounting services

Facilities for distributed authentication, charging, accounting and auditing are underdeveloped. A well-understood protocol framework for these operations will be critical for the development of significant information services on the networks. We are aware of some work in this area, but feel that it is sufficiently complex and wide-ranging to require a separate investigation, and recommend that the Libraries Review commission a report of existing activity and trends.

Conclusion and recommendations

The strategic importance of networking in support of new information services and resource sharing is recognised in the library community. However, there is no consensual view of the future of the communications-related activities of libraries, of which applications will support which services, or of which standards should be used to implement particular applications. We have tried to present a framework in which to discuss these requirements and have pointed to the standards and issues we feel are important. We make the following recommendations:

Some general recommendations

1. Much current activity is compartmentalised within particular sectors of the library and information world. There is a lack of cross-sectoral structures to promote awareness and coordination. Opportunities to influence national policy on network access, to develop consensus, to share experience and effort and to work towards standards and technical solutions which will enhance overall service provision are therefore reduced. The Libraries Review is well-placed to support and promote such structures and consider what is required, and should do so.

More specifically, initiatives in particular areas should establish appropriate links and coordination with other interests within those areas. (*e.g.* with the British Library, BIDS, LASER, the consortium of publishers developing the SuperJANET journal testbed).

2. Support should be made available for relevant library and technical representation on standards and profiling bodies, for example the EWOS Expert Group on Libraries. Such support should be linked to a mechanism for reporting back issues and development to interested parts of the community.

Policy issues

3. There is a need for a policy study on interworking with commercial and other non-HE partners. The growth of the commercial Internet will create a high level of demand for communication between that and the academic networks.

4. There is a serious need for a policy study on strategies for future protocol development, particularly in relationship to new generation networks such as SuperJANET. For example, what is the position of OSI applications if SuperJANET is initially IP-based. More generally, there is a need for policies that are independent of significant shifts in the technology base.
5. The ACN should be encouraged to develop, and publicise, a clear policy framework for connection to and use of the network by commercial information providers.

Communications services

6. A study is needed of gateway requirements for interworking with the Internet, *e.g.* X.400, Z39.50, ILL, *etc.* How, for example, could a link be set up between Z39.50 over OSI and Z39.50 over IP? Of similar importance, though less technically difficult, is communication between X.400 over IP and X.400 over OSI.
7. Support is needed for the development of X.400 email-enabled applications. These include document delivery, EDI, ILL and others.

Application services

8. The services offered by SR/Z39.50 are potentially of strategic importance for future library and information services. The Libraries Review should encourage its wider development. Specifically we recommend that the following be supported/funded:
 - the development of a Z39.50 client subsystem as being discussed by the UK SR/Z39.50 Pre-implementors' Group. This approach proposes the development of a Z39.50-based client application API, drawing on available code as appropriate and reflecting the specific needs, if any, of UK developers.
 - pump-priming to make a significant UK information resource available through an SR/Z39.50 server interface (BIDS is the obvious example within the UK academic community);
 - liaison, and where feasible, sharing of effort with appropriate bodies (British Library, SR/Z39.50 Pre-implementors' Group, LASER);
 - an innovative demonstrator project based on links between searching tools and holdings or location tools. An example would be a system building on SR/Z39.50 links between Inside Information or BIDS ISI and local holdings to flag articles that are in the local collection.
9. We recommend the commissioning of a feasibility study which investigates the potential usefulness of the ILL protocol (ISO 10160/1) for distributed request and loan management in the UK in
 - a store and forward, or e-mail, environment
 - a connection-oriented, or interactive, environment (to be compared with possibility of SR/Z39.50 extended service).

10. Any EDI initiatives should make use of the X.400 infrastructure and draw on the work of EDITEUR and EDILIBE.
11. A coordinated approach to the sharing of data between library housekeeping systems, and between other campus systems and library systems, is desirable, and projects should take note of any relevant MAC initiative developments.

Data interchange services

12. A range of file formats and tight specifications of them should be adopted. 'Flavours' of file formats need to be avoided; we also need to choose industry and international solutions. These should include: raster page image; page description language; document standard; vector graphics standard; terminal protocol for viewing. Suitable choices (in that order) **might** be: GEDI specification; PostScript; SGML; CGM; X with Motif Graphical User Interface.
13. SGML is likely to be the way ahead for storage of structured documents. We should look to promote its use and develop (in conjunction with publishers) a set of DTDs which can be used in the community.
14. We need tools and exchange formats for bringing in information into SGML documents which is not ASCII text - graphics, symbols, mathematics, *etc.* These need to be investigated and agreed.
15. We need to develop specifications for a file format for scanned documents; the GEDI specification is an appropriate initial consideration.

Meta-information services

16. The development of appropriate resource discovery solutions should be encouraged. In particular, the Review should consider what contribution the library community should be making to these developments. Specifically, potential synergies between BUBL, UKOLN and NISS in the development of resources and experience should be explored and supported.

Authentication and other services

17. A protocol framework for authentication, charging and related functions is urgently required if information services are to develop on the networks.

Networked information: tools and training. The role of the librarian in bringing these to end-users

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Abstract

This report covers the electronic information environment and activities in training users to use the network. It looks at the current situation and the future role of the librarian and makes some proposals for action.

THE ELECTRONIC INFORMATION ENVIRONMENT

Introduction

The advent of computer networks has enabled researchers to find, exchange and share information with colleagues all over the world. Each researcher with his PC, Macintosh or Workstation connected to the global 'Internet' network has the potential for 'publishing' information to the rest of the world via the network. Fortunately to date only a small fraction of the millions of Internet users are publishing on the network, but even so, the problems of information discovery, searching, location and retrieval are already severe. The dream is becoming a nightmare. Computing and networking experts are struggling with the concepts of classifying networked information resources and of uniquely identifying them. These are, of course, problems that Librarians have been tackling for hundreds if not thousands of years.

The Current Situation

Two quotes (both taken from conversations over dinner at the Network Services Conference last Autumn) sum up quite nicely the situation as regards networked information

Peter Deutsch (archie):

'This [Italian] menu is like using archie: I know there is something here I'd like
- but I don't know what it's called.'

Lorcan Dempsey (UKOLN):

'What we have is a flea market; what we need is a department store.'

The first quote relates to the lack of standardisation as regards the naming of files of information made available on the network. This is a natural result of the lack of publishing controls. Files are often given short cryptic names that mean something to the owner, but don't give enough information to enable others to judge whether the file would be of interest to them.

The second quote refers to the lack of classification and quality control of the information. It is quite easy for a researcher to spend hours roaming the network looking for information of relevance and to find nothing of interest. This is partly due to the fact that information coverage is patchy, there is much duplication and in some areas there is not much of value, but it is also due to the lack of organisation and structure.

It is high time the Librarian stepped on to the stage.

Networked Information Retrieval Tools

As the network has grown, along with it there has been an increase in the number of software tools and applications to navigate the network in order to discover, search for and locate some of the many and varied information resources which are part of the network. This has been the computer network specialist's response to the problem. Within the past year and a half we have seen a wide spread adoption of tools such as the archie servers, the Wide Area Information Servers (WAIS), the Internet Gopher, and the World Wide Web (WWW). In addition to the acceptance of these tools there are also diverse efforts to enhance and customise these tools to meet the needs of particular network communities.

Note: network people use the terms 'information retrieval' and 'archive' in a rather simple sense. The fuller meaning as used in a normal library context does not usually apply when talking about networked information.

archie

A large amount of information is available via anonymous ftp servers. These servers allow researchers and other network users to retrieve files of information from a remote file store (often called a file 'archive') without having to have an account on that particular computer. With several thousand file archives on the network, it would be a daunting task for a user to contact each to find what was available. archie takes some of the pain out of this task. archie enables network users to search indexes of what files are available on these public file archives. It currently indexes over two million files on some 1200 public servers. Having located files of potential interest using archie, a user can then retrieve the file using Internet file transfer.

Thus archie is a tool which indexes information and enables information to be discovered and located. It was one of the first of the emerging 'networked information retrieval' (NIR) tools.

The Internet Gopher

Gopher represented a giant leap forward in handling networked information. It allows a user to browse information resources on the network and, having found something of interest, to retrieve it using the same tool (gopher), rather than having to use a different tool such as ftp (as with archie). Gopher was also one of the first of the 'client/server' NIR tools. The user has a 'client' (piece of software) on his computer and uses this to access gopher 'servers' all over the world (although simple terminal access is also possible). The gopher world of networked information is presented as a series of hierarchical menus. The information in the menus may be on the same or on different computers. The geographic location of the information is largely transparent to the user. He can even place his own 'book marks' in order to go straight to a piece of useful information the next time. Many of the Gopher Servers have been set up by volunteers - mainly computing people, although some have had librarians employed to organise the information.

Gopher allows access to different types of information, including sound and video. It can also provide indexed searches of part of the information base. It is a very powerful tool. Its use has spread very rapidly and its popularity is partly due to its friendly, simple to use interface and partly due to the ease of setting up a gopher server to a set of information. (For example, a gopher server can be set up on a UNIX machine within a matter of hours.)

WAIS

Like gopher, WAIS may be accessed by either a WAIS client on the user's computer or via a simple terminal session to a WAIS Server. WAIS provides access to a set of inverted indexes for collections of information. Typically a user will formulate a query such as 'find me items about such-and-such', and WAIS will search its collections for suitable items and will return a list of these items ranked according to their 'relevance'. (This will actually be the number of times the word 'such-and-such' appears in the text of the item.) The user has the ability to refine the search by marking certain retrieved items as 'relevant' and then asking for 'more like these'.

Setting up a WAIS Server for a collection of information requires the building of an inverted index. As this requires extra effort and computer resources, there are only around 200 WAIS servers as opposed to several thousand gopher servers. WAIS has the capability to handle non-text information resources. Note that WAIS makes use of an enhanced version of the standard Search and Retrieve protocol, Z39.50.

World Wide Web

Like Gopher, World Wide Web (WWW) provides easy access to a wide range of information on the network via a client/server model. Unlike the other NIR Tools described here, WWW is based on hypertext. It is possible for the information organiser to set up links from words or phrases in a document to another related document or part of a

document elsewhere on the network. For example, the references section of a paper could contain links to the actual (electronic) papers referenced. WWW can provide an extremely powerful tool for finding relevant information, but does require a large amount of effort from someone to set up and maintain the links if its full potential is to be realised.

The above covers the NIR tools in widespread use. There is currently some good cooperation between some of the NIR tool developers. There are now gateways between gopher and WAIS, and World Wide Web and gopher and WAIS, so that it is possible to access subsets of the information via different methods.

One of the main problems to date as far as these NIR Tools are concerned (apart from their proliferation) is the fact that most of these Tools have been developed by volunteers. Much of the networked community is relying on these tools to access information all over the world from their desktop, and there has been no funding to support these tools.

The American National Science Foundation (NSF) have recently announced \$1.2M of funding for a new Clearing House for Networked Information Discovery and Retrieval (CNIDR). George Brett is the Director. Given the current concerns about the reliance of the community on software tools developed by volunteer effort and the pressure being brought to bear on some of these volunteers by their employers to get back to their 'real' work, the setting up of a centre for support is very welcome.

The Networked Information Retrieval Working Group

There are many organisations and associations that have recently begun to focus on the proliferating resources and tools for networked information retrieval (NIR). The Networked Information Retrieval Working Group is a cooperative effort of three major players in the field of NIR: the Internet Engineering Task Force (IETF), RARE - the Association of European Research Networks, and the Coalition for Networked Information (CNI). It is specifically tasked to collect and disseminate information about the tools and to discuss and encourage cooperative development of current and future tools. The NIR Group is co-chaired by Jill Foster (chair of the RARE Information Services and User Support Working Group) and George Brett (Director of the Clearing House for Networked Information Discovery and Retrieval).

This group has put together a draft 'Consumer Report' on the NIR area (edited by Jill Foster). The purpose of this report is to increase the awareness of NIR by bringing together in one place information about the various networked information retrieval tools, their developers, interested organisations, and other activities that relate to the production, dissemination, and support of NIR tools. The intention is to make this a 'living document' and to update it two to three times a year so that it provides a 'snapshot' report on activities in this area.

What is covered?

In the current report there is information on the following NIR tools:

Alex	archie	gopher	Hytelnet
Netfind	NCSA X-Mosaic	Prospero	Soft Pages
Veronica	WAIS	WHOIS	World Wide Web
X.500			

A loose taxonomy of NIR Tools would give classes of tools for:

- Resource Discovery
- Class Discovery
- Instance Location (indexing)
- Access
- Information Management

The report also covers the major groups working in the NIR area.

The Coalition for Networked Information (CNI) has several working groups including ones concerned with architecture, directories and the TopNode Project (Directory of Directories).

The Internet Engineering Task Force also has working groups (WGs) on a wide range of aspects of NIR: Internet Anonymous File Archive WG, OSI Directories WG, Uniform Resource Locators and Identifiers WG. The latter group is concerned with uniquely identifying information resources on the network (very much like an ISBN identifies a particular book) and members of the group have been talking to the Library of Congress and OCLC's USMARC WG.

In Europe there is the *RARE Information Services and User Support* (ISUS) WG and the *Nordic Search and Retrieve Project* (SR-NETT). Past European Networking Conferences have had sessions on WAIS, WWW, gopher,archie, Soft Pages and Hyper-G. ISUS WG members have agreed to co-ordinate the European gophers informally and to work on subject specific gophers. This work and discussion is progressing in co-operation with the IETF/CNI working groups and TopNode Project, Library of Congress and some Australian gopher experts.

There are many other groups at a national level of course (for example the UK's Information Networking Alliance).

The Consumer Report may be obtained via anonymous ftp from mailbase.ac.uk

file name: pub/nir/nir.status.report

On a positive note: the CNI held their meetings near Washington in November '92, at the end of the same week as the IETF. Several key CNI members attended the IETF and there was to be cross representation at the CNI meetings too. George Brett had set up meetings at the Library of Congress as OCLC and the Library of Congress are working on classifying or cataloguing networked information resources. The CNI TopNode Project is looking at doing this too - but are, I believe, taking a different approach. The Washington meeting was an opportunity for these people to get together and to start mutual discussions. It was a significant milestone on the road to bringing order to the chaos as far as networked information is concerned. There is

still a long way to go in satisfying end users of course; there is still the plethora of different tools - but at least computer networkers and librarians are starting to pull in approximately the same direction.

The role of the librarian in networked information retrieval

There has been much written on the 'Virtual Library' or the 'Library without Walls'. Many Librarians feel threatened by this scenario and by the current widespread availability of electronic information. It is important that this new challenge is met actively, and that librarians, rather than standing on the sidelines, capitalise on these new opportunities and are proactive in shaping the future of networked information provision and retrieval. This requires a decision by policy makers and funders to support the development of expertise in this area amongst key librarians and to fund pilot projects in each of the areas.

Training

Librarians need to be given in-service training on using networked information. The reference librarian should look on networked information as an integral part of his reference collection. This shift of emphasis at the coal face needs to be reflected in the curriculum for Library and Information Sciences courses. Librarians also need to train their users to navigate the ocean of networked information. They need to help them develop information retrieval skills. This is covered more fully below.

Order out of chaos?

Computing and network experts and some subject specialists have been making a stab at organising networked information. This is an area which could benefit from the application of traditional library skills; however these should not be applied unquestioningly to the new environment. European Biologists setting up a Biology Gopher have pulled together information of relevance to them which would not go under a strictly applied 'Biology' classification. With Gopher it is possible to have the same information appear under several different classifications for the convenience and ease of use of the end user, without the need to hold duplicate copies of the information. This may be a trivial example - but is used to illustrate the fact that we are not - and should not be - trying to create a simple electronic replica of a Library with books on the shelves.

Promotion of integrated access to electronic information

NIR is the area at present. Development of NIR tools is taking place at breakneck speed. Much work is going on to enable the various tools to inter operate, and to provide better searching facilities. The range of information available via the popular NIR tools is fairly restrictive at present and in the main is simple ASCII text; search facilities are also still fairly basic from the point of view of the information retrieval experts.

I have asked the RARE ISUS WG to look at the requirements for an integrated interface to networked information, be it on-line information files, multi-media information, information on mailing lists, *etc.* Ideally the user would not be aware that he was using gopher, archie or WAIS as the underlying mechanism. Recently a beta test software package NCSA X-Mosaic was released. From the preliminary reports (and having seen a quick demonstration) it seems to give access through one interface to gopher, WAIS, World Wide Web, the X.500 Directory Service and many others. The user still seems to need to know which underlying tool to use (though I may be wrong). I believe that we need to approach this from the point of view of what the end user requires and the facilities he needs for searching and retrieving all kinds of information. Librarians are ideally situated to provide valuable input and insight into the user requirements here.

The next year will see a national fibre research network. The next decade will see a radical change in the way information is delivered to the desk top. Multi-Media Information Services and full image document delivery services will be possible in the not too distant future. There is a real need to fund investigations and pilot projects in this area.

The voice of the librarian

Within the UK:

UK Librarians have been prominent both as a group of network users and as a group discussing potential uses of the network. JUGL has from the start been a very active JANET user group and a Librarian chairs the JANET National User Group. The JUGL volunteers have put together a Plan for Library Action in Networking, and volunteers run the highly successful BUBL - Bulletin Board for Libraries - which is well known internationally.

UKOLN and the newly formed Information Networking Alliance are other national bodies which should help to gather opinions and to formulate policies.

In the rest of the World:

Individual librarians and the National Bodies (UKOLN, JUGL, INA as well as the British Library) should take active part in the Working Groups and standards making bodies which operate on a European or world-wide level. Time and effort needs to be invested to ensure that UK librarians and other experts within the information field not only have a voice on the international scene, but also are able to keep abreast of developments elsewhere on behalf of the UK community.

RARE Information Services and User Support Working Group is actively involved in the promotion, provision and organisation of networked information. Librarians have started to make their voice heard here as members of this group - but more input is needed.

The RARE/IETF NIR group aims to help to pull together the work in the area of NIR by promoting awareness of work going on in this area and by encouraging the collaboration between the tool developers. A larger percentage of members from the Library community is required here.

NETWORK TRAINING

Introduction

As the range of information and services on the network expands - so does the potential user population. It is essential that these users receive training in using the networked facilities - in particular in making effective use of the tools available for searching for and retrieving information.

The following is a distillation of thoughts and experiences as a result of:

- UK NISP/ITTI Network Training Materials Project (at Newcastle upon Tyne) (started June 1st '92).
- Discussion on the mailing list: itti-networks@mailbase.ac.uk and at the JANET User Support Workshop September '92.
- UK NISP activities with training special subject groups.
- RARE/IETF WG Sessions on Training Materials
- The 'Internet/BITNET Network Trainers' List: NETTRAIN@ubvm.cc.buffalo.edu
- Aarnet Training workshops by Newcastle (NSW, Australia) network training team.
- Discussions with Australian Librarians during my seminar tour and subsequent presentation at the Australian national Networkshop (December 1992).

I am Project Manager of the NISP/ITTI Project, Chair of RARE Information Services and User Support WG and co-chair of the RARE/IETF Training Materials WG.

What's Happening?

NISP/ITTI Network Training Materials Project and RARE/IETF Training Materials WG

The NISP/ITTI Project and RARE/IETF Training Materials WG aim to collect together existing network training materials, identify the gaps in materials available and produce materials where appropriate. The aim is to provide generic materials that may (if required) be tailored to specific sites and/or subject groups. The training is to enable them to make effective use of networked information services.

A TopNode style template for the collection of this material will be issued. The NISP/ITTI Project has already produced a catalogue of existing training materials during its first phase, and the RARE/IETF WG intends to build on this work. Australians working in this area have

agreed to do the same. In addition common problems associated with network training are being discussed.

The NISP/ITTI Project has already produced Unit 1 of the network training materials pack. This has been beta-tested at a number of sites by librarians and computing service support staff.

NISP subject group training

One of the aims of the UK NISP Project is to help groups of academics build electronic communities, particularly with non-traditional network users. Work is in progress with several groups (librarians, social scientists and university administrators). The original idea was that, as part of this, a subject specialist would be trained to train his/her colleagues. In practice we have been running the workshops/seminars with some help from the subject specialists. National (UK) training workshops and seminars have already been held for librarians, social scientists and various other ESRC groups including humanities staff. Various seminars have been held for physiotherapists and a variety of other groups; more workshops and seminars are planned. There has also been some work done with local faculty liaison librarians.

Australia

Several university libraries and Newcastle University Library (NSW) in particular are making very effective use of librarians to train both other librarians from various institutions and small groups from particular departments within an institution. University of Newcastle Library (NSW, Australia) had local funding to develop a network training programme. Enid Roberts (Sydney) acted as Consultant and Jim Cleary and his team trained faculty members and ran 'train the trainer' workshops. They have covered most university libraries in NSW and Brisbane. They seem to have been quite successful in this.

Newcastle (NSW, Australia) found it best to second faculty librarians part-time. This meant staff kept in touch with printed material too. Also short term contract staff tended to leave taking their newly developed skills with them.

Both the NISP subject group training and the Australian training involves presentations, live demonstrations and a significant amount of hands-on experience in workshops with course sheets.

At the IETF in Washington the participants in the training session were mainly from Computing Services. Apart from the 'Mining the Internet' Sessions and the Merit NSFnet training sessions, there seemed to be (relatively) very little in the way of user hands-on training being done.

The role of the librarian in network training

Before visiting the Australian group, we had started liaising with our faculty librarians. Having seen how successful the Australian method has been, I am convinced that faculty/reference librarians should become involved in training their users to use the network and to search for information of relevance to them. They should know the networked information in their subject just as well as the printed information - and just as they help users to find printed information they should help and train them to find on-line information

Library staff have experience in managing information resources and in reader education. They also have good links with faculty staff.

My feeling is that the ideal 'coalition' for a training team is:

- Computing Service staff
- Faculty librarian(s)
- Subject specialist (for feedback and input and for local (departmental) support)
- Staff Development Officer(s)

This naturally brings up all sorts of problems about job descriptions, demarcation *etc.* and some people (often computing service staff) become 'territorial'. In recent presentations I've talked about today's users being able to roam the global network unrestricted by local or national barriers:

'Le USER sans frontieres'.

What we need therefore is to join forces and co-operate to provide

'Le USER SUPPORT sans frontieres'.

There are more users than enough to go around! and by pooling our resources and making the most effective use of our various skills we can do much to improve effective usage of the network. In order to cope with the increased number of users, we need to teach them to be independent - to start to be able to solve problems in using the network themselves. We have to help them by de-mystifying the network for them.

The emphasis of network training should be on understanding and on the relevance to their everyday work situation. Hand-outs with lists of interesting resources (*e.g.* Yanoff's or December's) - some actually tailored to suit the audience are useful. The training groups I talked to aim to pool these subject specific guides and add to them.

Library and information sciences courses

Networked Information Retrieval and use and design of NIR tools should form a major part of the curriculum of library and information science courses. We need to start training the librarians of tomorrow in the modern tools of the virtual library.

PROPOSALS FOR ACTION

Networked Information Retrieval

Organisation

- *UK Directory of Directories*
A Directory of UK Networked Information Resources following the guidelines of the US TopNode Project
- *UK Top Level Gopher*
There are several UK gopher servers, but currently one has to look at gopher servers in America or Sweden to see what is available. The Dutch National Network (SURFnet) has asked the Dutch National Library to organise the top level Dutch gopher. Having talked to UKOLN about this, I understand that they now intend to do the same for the UK. This gopher would then be set up with links to each gopher within the UK (geographic tree) and would also be set up with a Subject tree in which information available within a particular subject category would be grouped together under the same menu item, regardless of its geographic location.
- *Subject Resource Guides*
This follows on from the work in the last action point, but should include global resource guides in particular subject areas. There is scope here for collaborating with groups elsewhere. Some leadership and coordination is required here to ensure this happens on a systematic basis. Subject liaison librarians need to be involved here. Funding of Interactive Resource Guides which provide 'one-stop shopping' in a particular subject area (cf. the Biology Gopher) should be considered together with the appropriate funding councils.
- *Collection building*
There is scope for building collections of quality information. In the current environment there is a need for both the current 'flea market' approach and the 'department store' approach. Some will require the traditional services of the librarian in building and maintaining collections of information thus adding value to them, for example by sifting it to keep only high quality (possibly refereed) information. I believe, in the future, researchers will become used to paying for 'quality' information. In the meantime we require some pump priming activities. Collections could be logical collections, where only links to the information are held, rather than the information itself. Note that in this case, unlike collections of printed material, it is not necessary to provide multiple copies of the networked information.
- *Facing the challenge*
Much thought needs to be given to the issues involved in organising networked information. Does it make sense to reinvent the card catalogue here - or is there another more appropriate method? Is there a way to help the user build his own 'catalogue', that is, his own view of the information web? Such a personal

collection could be passed on to a new research colleague to help reduce the learning curve.

Networked Information Retrieval Tools

- *Total Solution User Interface*
The RARE ISUS WG is looking at what I have rather tongue-in-cheek named the 'total solution user interface'. The idea is that the user's access to networked information resources should be fully integrated with his word processor, electronic mail utility *etc.* (Just as some software has integrated word processor, spreadsheet, database and graphics packages into one). NIR Tools such as gopher have taken a good stride towards this goal - but there is still scope for quite radical new approaches to this. Discussion and support of pilot projects in this area are needed. Librarians need to be involved in promoting this integration now and in the future. This needs to be achieved in such a way as to preserve the 'magic' of the Library.
- *Multi Media Information Services*
There is a joint RARE task force of the ISUS WG and the Interactive multi-media WG which is looking at multi-media information services. This group was formed in November '92 and requires funding for pilot projects in this area and for a repository of multi-media information for use in such pilots. With SuperJANET, such pilot projects in the UK would be quite feasible. We need to develop UK expertise in these areas.
- *Future 'Intelligent' Information Retrieval Services*
Prototype 'Knowbots' exist that allegedly 'roam' the network looking for information of interest to their clients. Developments in artificial intelligence could result in an electronic reference librarian, with which the user would engage in a series of questions and answers. This user agent could then regularly perform a search for information of interest to the user on his behalf. Such a scenario was the subject of a BBC programme by Douglas Adams entitled 'Hyperland'. This may seem rather futuristic and of course, the human reference librarian will always have an important role to play, but it is important that research projects in this area are funded.

Network Training

I would like to see the funding of a National Network Training Programme which would encompass the following:

- *Development of network training materials for use by Librarians and others to teach users how to use the network.*
This should build on the generic network training materials produced as part of the NISP/ITTI Network Training Materials Project. Librarians and computing staff are contributing to the production of these materials by beta-testing them and

providing evaluative feedback. The involvement of the support community in the development of these materials will help to ensure their widespread usefulness.

- *Maintenance of these training materials.*
It is important that training materials are kept up to date to protect the investment in their production and to keep them relevant.
- *Regional network training centres*
To facilitate access to network training courses, purpose built training facilities should be made available on a regional basis. This could be achieved by providing additional funds to institutions setting up their own training facilities or learning resource centres, on the condition that the facilities are made available for regular regional network training sessions.
- *Promotion and Publicity of the use of Networked Information Resources*
A large part of the higher education community (and indeed of the library community) is still largely unaware of the network and the networked services. The NISP Project has been working on a variety of publicity materials and uses a range of channels for promotion of the use of networked information resources. Much has been done, but there is still much to do! Additional funding of such efforts and the involvement of librarians would be beneficial.
- *Network Training Workshops aimed at user communities (cf. NISP Project)*
Tailoring of the materials to specific disciplines by the use of subject specific examples is desirable in order to improve their relevance to the trainees. The NISP Project has successfully run workshops for specific user communities using tailored generic training materials. It would be possible to provide a consultancy service to subject groups wishing to design and run their own courses.
- *Pilot projects using the network to deliver training*
From experience with the various training initiatives, it is obvious that the use of the network to deliver training is feasible and desirable. It would be possible for example to set up a gopher service for training new users in use of the network, another to store and deliver up-to-date training materials for support staff and, in the reasonably near future, to use SuperJANET to deliver video training.
- *Development and provision of in-service training courses and workshops for librarians in the use of networked information.*
- *Recommendations to Library and Information Sciences Curricula developers.*
It is important that the new generation of librarians is conversant with and feels comfortable with the range of networked information services available. Many LIS courses do indeed include an element on this. It would be useful to find out what the plans are to extend the coverage of these aspects of the courses.

The NISP (Mailbase) Project has experience in network training both of end users and of librarians. Good links have been built up with both the local library community and with

JUGL and UKOLN. A collaboration between NISP and a small number of institutions' computing centres and libraries could provide a cost effective way of delivering network training.

Miscellaneous

Other areas will no doubt be covered by other papers to the Library Review Group. There is a need to fund pilot projects and to develop expertise in the areas of:

- *Electronic Document Delivery and*
- *Electronic Journals and Publishing*
Policy, copyright, funding and other issues such as human and social disciplines can only be realistically discussed in the light of experience. Charging, accounting and authentication issues also need addressing.
- *Archival*
Much computer stored text is deleted once out of date. For some information, traditional archival services are required. This area needs more investigation.
- *The voice of the Librarian*
There needs to be funding of the effort and travel of UK experts in the library and networked information field in order that they may make active representation to European and International Working Groups and standards making bodies.

As chairman of RARE ISUS WG, I currently have limited travel funding for WG meetings, although it is likely that this RARE funding will not be available next year. My RARE work is done on a voluntary basis as is the work of others involved in RARE and IETF Working Groups. A year ago European Commission funding for national representatives and experts to attend RARE WG meetings was withdrawn. Countries such as the UK and Germany have not in general taken over the funding of these activities by their experts. The absence of these experts is having a detrimental affect on the output of the group and it is difficult to build a European consensus. In contrast, the Dutch networking body, SURFnet, funds key people from Dutch institutions to take an active role in RARE Working Groups

JUGL, Planet and UKOLN are other obvious candidates for funding for both UK and European work.

- *Active support of collaboration between Libraries and Computing Centres.*
The Dutch Document Delivery Projects Report recommends that joint seminars be organised for University Librarians and Computer Centre Directors, together with representatives from the National Library and the National Research Networks. There should be support for this type of collaboration in the UK too.

- *Support for the Library Community:*
It is essential to support the volunteer efforts within the UK Library community and to enable discussions and collaborations to take place. Currently this takes place using such services as:
 - BUBL (currently receives a small amount of funding)
 - Mailbase (currently funded through SISC).

SECTION 4: REFERENCES

1. Ed Krol. *The Whole Internet User's Guide and Catalog*. Sebastapol, CA: O'Reilly and Associates, Inc, 1992.
3. Scott Yanoff. *Special Internet Connections compiled by Scott Yanoff*. anonymous ftp csd4.csd.uwm.edu pub/inet.services.txt
4. John December. *Information Sources: the Internet and Computer-Mediated Communication*. anonymous ftp: Host: ftp.rpi.edu, file:pub/communications/internet-cmc
5. Jerome H. Saltzer. *Technology, Networks, and the Library of the Year 2000* (conference paper)

(1 March 1993)

ADONIS at Aston: introducing electronic document delivery in the networked library

Sheila Corrall
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Introduction

At the start of the current academic session, Aston University Library & Information Services (LIS) began to implement ADONIS, a revolutionary new way of accessing biomedical journal articles via a dedicated PC workstation and CD-ROM jukebox. This system is an innovative full-text service which includes high-resolution graphics, enabling rapid reproduction of both text and illustrations to a higher standard than conventional photocopying. It is a subscription service, covering approximately 500 journal titles, supplied weekly on disc; in addition, royalty charges are payable for each article printed. Aston is the first academic library in the UK to install the system. We are running a full working trial for one year in the first instance, during which we will conduct a technical evaluation and a survey of customer reactions, and also attempt some cost/benefit analysis.

Background

This system has been introduced within the context of a well developed and publicised strategy of innovation through reliance on and exploitation of information technology, appropriate to a leading technological university. Aston has always invested an above average proportion of its resources in IT, and during the 1980s (with support from the UGC and DTI) installed a £4M broad-band OSI local area network, which spans the entire campus and provides some 2,600 connection points for both data and video services. The University aims to integrate the use of IT into all aspects of teaching, research, administration and services. Microcomputer-based word processing, spreadsheets, desktop publishing and database systems are widely used across the institution, and there are clusters of PCs sited in central locations (including the Library building) and in academic departments for students to use a variety of tools, packages and simulation in the learning process. The restructured Information Systems department comprises three divisions - Facilities Management, Management Information Systems and

Services; the latter works closely with LIS to support learning and research through teams of specialists responsible for liaison with the nine academic departments.

LIS has also invested in its IT infrastructure in support of all its activities, and over the past decade has been transformed from a traditional university library into a modern information service, more akin to the specialist units generally associated with industry and commerce. Automation of library housekeeping operations has been followed by the progressive installation of self-service electronic information systems; the creation of an Information Skills Suite, with sophisticated facilities for demonstrating and teaching search and retrieval techniques; and the introduction of office automation and electronic mail. An increasing proportion of library services and most of the CD-ROM systems available in the Library building are also accessible across the campus from individual offices and departments. We aim to be at the leading edge of IT-based service provision, and have been involved in innovative national and international research projects, such as the UK Satellite OnLine Searching Training Interactive Conferencing Experiment (SOLSTICE) and the European Interlending OSI Network (ION).

Our strategy is based on the concept of a locally-held core collection of resources to meet primary needs, complemented by rapid access to remote sources identified through a wide range of information services and backed up by effective document supply services. Our Mission is "to facilitate *access* to all forms of information, by continuous improvement of: *resources* and *expertise* to meet customers' needs; *information management skills* within the Aston community; and *co-operation* through local, national and international *networking* - to support learning, research *and* other University activities". We have thus made an explicit commitment to an 'access' or 'demand' strategy (as opposed to the 'holdings' or 'ownership' model) and we also see the development of information management skills as an important part of our role in helping to equip Aston students (and staff) for their future careers. Effective utilisation of IT is crucial to the fulfilment of our objectives. We are moving from a 'just in case' to a 'just in time' philosophy, and we envisage a future characterised by a significant shift from hard-copy to electronic resources, increasingly substituting networked access to remote information sources for local on-site library provision.

During 1992/93, LIS (in common with other university departments) had to find substantial savings in its budget for the coming year. Having already cut back in other areas previously, we had no option but to look for the required sum from our periodicals budget. The sum involved amounted to the equivalent of 25% of our current serials budget. We were already seriously considering the introduction of ADONIS, as for some time we had been looking for the opportunity to take a major electronic initiative in support of the Life Sciences departments (having hitherto concentrated on business information systems). One of the attractions of the system was the prospect of providing immediate access to some 500 journal titles, of which only 70 or so were represented in our current subscriptions, thus offering the possibility of some savings in interlibrary loan costs. Our original intention was to follow previous practice and run a trial of the electronic system in parallel with hard-copy provision, and to consider cancellation of print subscriptions in consultation with the relevant departments only at the end of the trial period. However, the change in our financial position caused us to think again, and we decided instead to cancel the hard-copy versions of titles covered by ADONIS (except for a small number of very heavily-used titles).

The ADONIS experiment

A single workstation has been installed in LIS and made available on a self-service basis (like all our other CD-ROM systems). For each department, three user groups have been identified - staff, postgraduates and undergraduates - and a password set up for each group. During the evaluation year, the service is only available to Aston staff and students. Users can search ADONIS for documents, using combinations of elements from the bibliographic record (*e.g.* author name, title word, journal title, year of publication, volume/issue/page number) but it is primarily a document delivery system and not intended for information retrieval. (We therefore advise people to use Medline on CD-ROM for subject searches, and then retrieve documents from ADONIS if appropriate.)

Although the service was launched according to plan in October, the trial proper is only just beginning now as the 1993 subscription cancellations start to take effect. However we are already aware of some specific problems with the system, as far as our customers are concerned: contents pages are not included; articles are not easily browsable on screen; print royalty charges are per article rather than per page; and using the mouse and cursor combination to navigate through the system can be difficult. To overcome some of the perceived difficulties of using the system, we are developing our own local document delivery system: the LIS Computer Officer has succeeded in networking the indexes, so that staff in departments will be able to locate, display and print contents pages, identify specific articles of interest and electronically request LIS to print them; the articles will then be sent by internal post. (This service will be offered to staff only initially, with students expected to use the service within the Library building.) The next stage is to investigate networking the images themselves; the suppliers advise us that this will slow down our network unacceptably, but our network managers think otherwise.

As indicated above, we are in process of carrying out a full evaluation, assisted by a group of students from the University of Central England School of Information Studies. The students will be using a standard checklist to evaluate both the ADONIS interface (which is based on Windows) and the networked indexes interface that we have developed at Aston. They will also be conducting a series of interviews with customers in an attempt to gauge user reactions to the service so far; these will be structured interviews, based on a brief questionnaire that we have devised.

The introduction of ADONIS at Aston was probably more problematic than it may be elsewhere, because of its link with our serials cancellation exercise and the necessarily compressed timescale, which did not give us sufficient opportunity to consult users properly, nor to ensure that they all had the technical capability and confidence to access the system. In the short term it has enabled us to make significant savings in subscription costs, but at the price of unknown future royalty costs. (We have some non-recurrent reserves to fund this for the current year.)

The experiment has both operational and strategic implications: in addition to the interface evaluation and user survey, we are investigating the life-cycle costings of our journals, to see what the true savings are when a printed journal is cancelled (taking into account all the costs associated with acquisition and storage - ordering, receipt, processing, binding, *etc.*). We are

also reviewing our resources model in more detail, to ensure that it is flexible enough to encompass ADONIS-type services. Despite not yet being in a position to evaluate the service properly, we can offer some general observations on the introduction of electronic services, based on our experience to date with ADONIS and other electronic systems.

Critical factors

IT infrastructure Migration towards the electronic or 'virtual' library is dependent on having an effective IT infrastructure in place - locally, nationally and internationally. This requirement embraces both technical aspects - ensuring connectivity and appropriate user interfaces - and service elements, such as operator support and help desk facilities, which ideally ought to be available to coincide with opening hours for the library and PC laboratories. An information skills workshop enabling 'hands on' group instruction in the use of electronic systems is probably essential.

Strategic fit Library strategies cannot be developed in isolation, but need to be considered in the broader context of the overall information systems strategy of the institution, and must also be consistent with (and reflected in) academic plans and priorities. At Aston our most successful experiences have been with the Business School, where the use of electronic sources is not only an integral part of teaching programmes, but has actually helped to shape their development.

Computer-literate population Both students and staff must not only have access to the network, but also the skills and confidence to use the facilities. This implies an ongoing awareness and training programme, with refresher sessions as well as initial instruction (supported by adequate documentation and/or on-screen help).

Communication / consultation The importance of involving academic staff at an early stage of planning any new service developments cannot be over-emphasised. Establishing close working relations will also help to guard against making false assumptions about staff attitudes and competence in relation to IT.

Pump-priming funds The transition from print to electronic sources can be eased by operating the two modes in parallel at first, and gradually reducing hard-copy holdings, starting with material of marginal value. If such funds are available, a phased introduction is possible (allowing demand to be assessed properly) and different systems can be evaluated and compared; but this type of investment is less likely to be forthcoming in the current environment, with the trend towards devolved cost centres and formula funding.

Copyright, licensing and leasing arrangements The present situation is highly complex, with suppliers offering a multiplicity of different terms and conditions (e.g. in specifying the number of users permitted simultaneous access via networks, or prohibiting downloading of data into personal bibliographic management systems). Products that initially seem to provide a cost-effective solution can become very expensive when networked; pressure must be brought to bear on suppliers to adopt a more uniform approach.

Pricing policy and stability The problems associated with escalating journal costs, exacerbated by currency fluctuations, are not necessarily eased by switching from print to electronic media. For example, the royalty fees charged for printing-out articles from ADONIS are subject to the same volatility as subscriptions for printed journals; this is more difficult to budget for than ILL, and when combined with printing costs poses problems for libraries with an established policy of making information available free at the point of use. (However, other suppliers, such as IPC - IEE/IEEE Periodicals Ondisc - offer an allowance of 25,000 pages before charging royalties.)

Staff support The introduction of self-service electronic information systems is unlikely to result in staff savings; indeed, the contrary is invariably the case, as CD-ROMs generate further demands on enquiry desk (and issue counter) staff, in addition to requiring significant input of staff time to prepare user documentation, provide instruction to library staff, launch the service and train users. At Aston, we also regard dedicated *technical* support as essential: we are heavily dependent on the expertise and energy of our own LIS Computer Officer.

(February 1993)

Valuing the results more than the medium

Mel Collier
De Montfort University

1. Proposition

This paper supports the proposition that the HEFCs should take steps to stimulate substantive change in university libraries and related publishing mechanisms. The change entails a significant shift from automation of book collections to electronic sourcing, storage and delivery of research and learning materials.

2. Assumptions

- 2.1 Despite the present brake on expansion, the government still intends to attain its goal of 33% participation rate by 2000.
- 2.2 Many institutions are already intending to increase library capacity to cope with the expansion achieved so far. Without change there will be a huge demand for buildings.
- 2.3 Even if assumptions 2.1 and 2.2 were not true the information explosion dictates that new types of academic libraries emerge.

3. Question

- 3.1 Should we be building additional book storage capacity in the sector at all in the electronic age?
- 3.2 If so where and of what size should the capacity be?
- 3.3 Should we rather be building to accommodate students working in an electronic environment?

- 3.4 If so, of what type, design and size would these buildings be?
- 3.5 What are the economic implications of a major shift from paper-sourced to electronic-sourced academic information services?

4. **Hypotheses**

- 4.1 Electronic publishing, interchange and storage will substantially **reduce** book and journal storage requirements in UK university libraries over the next decade.
- 4.2 Other pressures will tend to **increase** study space requirements, *e.g.*:
 - (i) trend towards resource based learning
 - (ii) trend towards multi-media and CBL
 - (iii) space efficiencies gained elsewhere drive students into the library.
- 4.3 Research (and undergraduate) collections in the humanities are less amenable to the electronic library concept because of different publishing environments, longevity of material and scale of retrospective digitisation.
- 4.4 There will be a steady increase in students following programmes involving less class contact *e.g.* by open learning, distance learning independent and contracted study. This will lead to requirements for highly flexible libraries *e.g.* 24 hour opening, network access, improved support facilities.
- 4.5 Electronic libraries are inherently more cost effective, flexible and supportive to learning than large paper-based libraries.

5 **Issues**

5.1 **Economics**

Because of natural conservatism on the part of universities and natural caution on the part of publishers, little has been established or synthesised about the economics of electronic publishing and its relation to library supply and services to the library user.

For the publishers the issue is how to diversify into electronic sourcing and supply while maintaining income streams and profit margins. They also quite rightly point out that there is more than a profit motive involved; they are intrinsically involved in the dissemination of knowledge and it is arguable that important activity, like synthesis, would not be done without them. At the same time, the needs of the publishing industry should not dictate the research dissemination process and certainly not dictate how universities manage their resources.

For libraries the issue is how quickly and how pervasively will IT sourced services replace print-on-paper sourced services. The whole span of library economics is

affected: capital buildings and equipment, staffing levels and staff development, ability to cope with information explosion, access of large student numbers to materials, revenue balance between journals, books and electronic media and cooperation with other universities. The subject is not impenetrable and is amenable to investment appraisal and sensitivity analysis.

5.2 Strategic management

Many universities are recognising the interdependency of teaching and learning methods and library/learning sources and the crucial role they play in university efficiency. This recognition is reflected in management collocation of libraries, IT, Media and in some cases teaching/learning and staff development. The HEFCE is right to draw the same strands together in its national planning.

5.3 Research collection

Research collections are inherently inefficient. Vast quantities of paper are stored which are hardly ever read and which give a very poor return on investment. This leads to the paradox that those institutions which pride themselves on and make great marketing play of their large research collections are in fact running in part inefficiently, and being subsidised in this respect by the more efficient universities. It would be doubly paradoxical if those institutions with large research collections were allowed to claim a larger share of research funding while they operate inefficient research collections.

IT has the potential to transform the concept of the research library, and research selectivity should recognise those institutions which introduce efficiency into research by means of IT.

In parallel it would be quite reasonable to propose that paper based research collections (which will inevitably remain for a long time) should be regionalised, but research funding to all institutions and particularly to universities hosting regional collections, should be conditional on free and unhindered access (loan and reference) to researchers from all institutions.

A vibrant regional access system could also have the beneficial effect of introducing competition with the BLDSC and avoiding the distinct possibility of unregulated monopoly when BL is under pressure to maximise its income.

6. Electronic journals and research assessment

There is now a wide degree of discomfort about universities having to pay uncontrollable sums for research documentation which they themselves have originated. This is exacerbated by the research assessment process which appears to value the medium more than the results. There is no reason why electronic journals

cannot provide the appropriate refereeing and dissemination and efforts should be made to promote them.

This change could come about in two ways. Research funding agencies and universities could act in consort to break out of the self-imposed yoke of paper based journal evaluation.

Secondly, it is possible that market forces within the research publication industry could break the mould, but only if there was an attitude change in the academic community.

7. Cooperation and competition

It is clear that cooperation between universities will be required to achieve structural change. This message is coming through also from the teaching and learning technology debate. In the industry pre-competitive cooperation must be encouraged in order to press on with technological development. Cooperation is not anathema to competition but the right balance must be found. Librarians have an excellent record in cooperative development, particularly in IT, and have brought huge efficiency gains to the sector. In many ways they were twenty years ahead of other parts of the sector and have much to offer in the way of strategic thinking, models and experience.

8. Technical

It is impossible to detail the technical issues involved in this complex issue but some of the broad areas for attention are suggested here.

- (i) Standards for electronic publishing and direct delivery to libraries.
- (ii) Document image processing for management of material not in character encoded form.
- (iii) Image bank technology for information management in art, design, CAD, CAM, architecture *etc.*
- (iv) Advanced information retrieval and hypertext.
- (v) Management of CD-ROMs and electronic books.
- (vi) Retrospective digitisation and conservation of electronic media.
- (vii) Pressing for agreement on electro-copying.
- (viii) Management of multi-media teaching and learning.

9. Recommendations

HEFCE should:

- 1. Promote the economic modelling of electronic library concepts at national and institutional level and within the publishing and library supply industries.

2. Promote large-scale actions aimed at bringing about structural change and enabling technological innovation.
3. Promote local innovation through cooperative development programmes and individual demonstrator sites.
4. Recognise and reward efficiency in service provision through IT.
5. Ensure maintenance of access to conventional research collections through the funding mechanism.
6. Use its good offices to encourage agreement on electro-copying.
7. Promote the development and acceptance of electronic publication of research.

(March 1993)

IT and libraries: a taught course perspective

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The library input to taught courses

Library services to courses can conveniently be placed in three groups:

1. *Document Delivery:* Lending, reference use, photocopying, inter-library loan.
2. *Information:* Enquiries, catalogues, locally-produced subject indexes and literature guides, information skills tuition, current awareness.
3. *Study Facilities:* Individual and group study spaces, heating and lighting, AV and IT equipment, support services (*e.g.* food, stationery).

These services are mostly common to 'old' and 'new' universities, but there are differences of emphasis. A specifically 'new' university perspective is provided in *Appendix 1*. *Appendix 2* contains a paper (co-written with Joan Day) originally prepared for the Management Sub Committee of the Libraries Review which outlines the library issues relating to the 'non-traditional' student.

Library issues

The current problems in providing these services for taught courses include the following.

In the area of document delivery:

- members of large course groups, all with the same assignment, making a simultaneous demand for the same item
- overlap of demands between course groups
- theft, 'hiding', and mutilation of open access stock

- extreme peaks and troughs of demand - for books, copiers, everything!
- short time-scales for delivery (basically from teaching patterns but growth of on-line catalogues and services are raising student expectations of immediate response for all services)
- conflicting demands of full-time and part-time students (see *Appendix 2*)
- need to maintain a wider range of primary literature to support open-ended, student-defined projects and dissertations as learning becomes more 'student-centred' (and sometimes the sheer numbers of students and overlap of subjects means there is a need here too for multiple simultaneous access)
- higher use of issue, reservation and ILL services creates financial, staffing and computer system performance problems

In the area of Information Services:

- growing student numbers overwhelm enquiry point staff and steal more and more effort from other work - the 'constant queue' syndrome that makes progress with 'background' tasks impossible for more and more of the day
- students need more help from library staff for all sorts of reasons - *e.g.* less direction from lecturers, assignments which are more library-dependent, wider range of students who lack experience and confidence with libraries, growing range of possible sources, explanation of IT-based sources such as CD-ROM
- locally produced subject-based indexes and publications are harder to keep up-to-date because of lack of staff time
- the power of automated catalogues and number of access points must be regularly increased to meet growing demand - system enhancement has become a constant activity
- information handling skills tuition groups become too large for effective teaching of the subject matter, and too many to handle with no increase in staff
- current awareness services are difficult to maintain

In the area of Study Facilities:

- at peak times study facilities are overcrowded
- demand grows for 'noisy' and group study facilities, while some users still require silence; groups such as postgraduate students become more vociferous in demanding special facilities

- the variety of AV formats has reduced, but IT sources and general-purpose microcomputers or terminals at present require more spacious study places and can be noisy, staff time-consuming, and revenue-consuming
- there seems to be insatiable appetite for more IT-equipped study spaces - without any compensating reduction in demand for the traditional table and chair
- students expect more support services such as refreshments, sale of stationery, computer manuals and floppy disks

Underlying many of these issues is a recurring question about the sloppiness and inadequacy of planning between teaching and library staff, mainly because teaching staff continue to take a very individualist line and to resist a more disciplined approach based on recognition that student learning in a resource-constrained environment requires carefully planned use of resources. A typical example recently was the case of 270 students from one course all unleashed simultaneously on the library with no warning whatever to do a project assignment on the electricity industry.

How can IT help?

In the case of Document Delivery:

- electronic storage of the most used sources - 'The 10,000 Top Chapters'? - could alleviate the multiple access and security problems: no-one (hopefully) could 'hide' or steal the only copy; printing out on local printers would also reduce some of the peak load on photocopiers BUT:
 - advances are likely to happen unevenly across subjects, with more progress in subjects (*e.g.* law, business) where topicality is important than in subjects (*e.g.* history, physics) where steady accretion of knowledge is the norm;
 - short-term progress in some areas will be severely limited by the lack of resolution and poor graphics handling of much of the installed base of computer terminals; by the lack of terminals and networks; by user resistance to screen-based reading (while using computers is popular, most students still spend far more time with print); and copyright problems;
 - progress at all will be limited by the willingness of teachers to use more of other people's materials and to limit their personalised contribution to motivation and facilitation;
- the same technology could handle local lecturer-produced materials (if lecturers will release them)
- electronic transfer of messages and files could hasten supply of items not locally available - thus reducing the large number of very rarely (or just possibly) used items which currently are held locally, and releasing funds for moderate duplication of moderately high use print-based sources

- meeting demand for the most heavily used items would reduce the load on issue and reservation systems for printed sources
- if research material were made available more cheaply by IT means (or at least costs were contained!), then more funds would be available to support teaching

In the case of Information Services:

- suitable electronic help facilities can answer some of the enquiries - but may just generate more higher-level demands
- electronic network-based enquiry services could reduce physical congestion at peak times and extend availability geographically to far-flung sites without consequent staff multiplication - provided the network is widely available and very user-friendly, and provided students have home-based dial-up access (how could this be achieved quickly? Is a Minitel-type equipment distribution programme needed?)
- electronic networks have already aided catalogue production; the same principles could be extended to local subject indexes and publication guides - permitting both centralised and cooperative production
- some aspects of information handling skills tuition are suitable for IT-based delivery - *e.g.* basic orientation, guides to standard sources, workbook-based exercises
- electronic preparation and delivery of current awareness services offers a range of new possibilities

In the case of Study Facilities:

- it seems likely that IT will have least effect on the space needs of libraries for study space - any reduction in numbers due to more remote access will be compensated for, in the short term at least, by the greater area per reader space needed and rising demand (*e.g.* more student-centred learning; learning displaced from classrooms to computer-aided individual access)
- it seems unlikely that IT can help with the conflicting demands for group study and individual silent study space

Nonetheless:

- if students have suitable network access, remote access from student residences or on a dial-up basis from anywhere to the sources mentioned above may alleviate some peak demand by allowing a 24-hour spread

- networked services offering 'core' sources and enquiry services could in some cases reduce the need for smaller site libraries to be open long hours - provided the libraries which are open and the network services cover the subjects needed.

Recommendations for the HEFC Libraries Review

The HEFC Libraries Review should take steps to encourage:

- a) library staff development which will increase awareness of the possibilities of IT and IT skills
- b) implementation of comprehensive network infrastructures by all institutions
- c) development of user-friendly, integrated CWIS facilities and inter-connection of various electronic sources and services (*e.g.* UKOLN, CHEST, NISS)
- d) libraries to be active in implementation of CWIS facilities and universities to use the information handling skills of their library staff
- e) teaching staff to make use of 'shared' materials
- f) dissemination of good practice in all the above
- g) sector-wide deals with publishers and preparation of copyright-free or shared materials (cf Open Learning Foundation)
- h) easy-to-use network and local facilities for electronic message and file transfer by library staff and library users
- i) cooperative production of electronic information guides and indexes to sources
- j) determination of best practice for physical provision and management of IT facilities in and by libraries
- k) electronic journals as a partial substitute for print
- l) IT-based information handling skills tuition (Travelling Workshops revisited!)
- m) institutions to consider the organisational implications of convergence between library and computing services and HEFCs to promulgate best practice

(21 February 1993)

APPENDIX 1. A 'NEW' UNIVERSITY PERSPECTIVE ON IT AND LIBRARIES

The IT base

The 'New' universities generally start from a lower level of sophistication and availability of IT network services - there was no national networking initiative with earmarked funding. Many institutions still do not offer JANET access to all staff and students.

The principle adopted for SuperJANET of bringing every institution to a middling standard as a priority is clearly important if students at some institutions are not to be short-changed. (This includes the colleges.)

Institutional characteristics

Teaching has a higher profile than research - though reward structures do not always reflect this and some academic staff clearly yearn for what they see as the old university pattern; there are relatively few postgraduate research students; strenuous institutional and individual efforts are being made to increase research profiles. (NB Think of the impact on the volume and cost of periodicals to be published!)

The student body is much more varied (see *Appendix 2*) and across the sector around one-third of new university students are part-time compared with a handful in most old universities. More students come from lower-income groups, more are self-financing and more have families to support.

The institutions are significantly less well found in most resource-related respects - usually there are residential places for less than 10% of students; teaching and library space utilisation is much higher; there are proportionately fewer higher-paid posts for staff.

Central management is rather stronger than in many old universities; multi-sites are more common than purpose-built large campuses.

Teaching characteristics

Student learning methods are varied, with extensive use of group projects, placements *etc.* - alongside high student loads of lectures, seminars, laboratories, and continuous assessment in some subjects areas. Use of 'course readers' - and take up of Open Learning Foundation shared materials - is less well-developed than some may expect. There are good reasons for this, to do with the complex advance organisation required, the lack of economies of scale (especially in regard to updating), and the flexibility and cheapness of the old-fashioned lecture!

Library characteristics

Libraries have smaller stocks, which are heavily used. Funding per student is typically half to two thirds of that in old universities. There is more emphasis on delivery of services and exploitation of collections than on passive anticipatory collection. Libraries are well integrated into the course planning and academic life of the institution, operating in theory as an integral service to departments rather than a free-standing entities with their own goals. This is helped by the generally heavier course validation and review processes derived from the CNAA model. But at the individual and practical level there are still problems over issues such as acquiring copies of reading lists in time to take preparatory action - one library now has a post entitled Reading Lists Librarian!

Departmental libraries are not common - partly for financial reasons, partly because of the more centralist management approach, and mostly because the multi-sited character of the new universities means that 'central' library resources are already more geographically spread and are physically close to teaching departments in Faculty or Subject libraries.

But some special categories of material are sometimes held in separate departmental collections - *e.g.* slides for art history; language learning materials; maps for geographers; specimen 'old' and childrens' books for librarianship courses. And departmental libraries or 'resource rooms' exist in some departments.

There is a recent tendency to revive the idea of 'multi-media resource centres' combining library, IT and media services - an idea popular in colleges of education in the 1970s before they were mostly merged with polytechnics and assimilated into a usually more traditional functional structure.

Libraries have been over-run by the rapid expansion of student numbers in recent years - some of the fastest expanders have at last begun to increase the resources devoted to library services.

(21 February 1993)

APPENDIX 2. 'NON-TRADITIONAL' STUDENTS AND LIBRARIES

Definitions

Any definition of 'traditional' or 'non-traditional' is a crude simplification, but is helpful if the limitations are born in mind. A 'traditional' student in UK higher education typically:

- is full-time
- during term lives locally and can easily visit library at any time
- has no responsibilities for others
- has fees paid and receives some Government and/or parental financial support towards living costs
- has recently completed 'A' levels and 6th Form/College - which are all designed to prepare the student for a university course
- is often distracted from studies by social development and tends to be a passive learner.

'Non-traditional' students are more varied, but usually possess some of the following characteristics:

- part-time (usually one day or one evening per week), distance or mixed-mode attendance
- increasingly are full-time mature students, usually joining via Access courses
- live further away from the university and therefore can conveniently visit the library on only one or two days a week at most
- have other responsibilities and commitments - financial and social
- receives no grant and often must pay own fees
- are less well prepared and practised in studying and have less self-confidence in abilities
- more highly motivated towards studies and more demanding because of greater personal sacrifice involved and greater life experience.

Problems for libraries in serving non-traditional students

- students tend to lack experience of using academic libraries and part-time or distance study means that learning can take many months more than for a full-timer
- over-crowded lecture timetables, library opening hours and travel limitations mean use of the library is impossible or very limited on course attendance days
- visits to the library at other times are not easy because of other commitments and travel involved
- there is often less library staff support on duty at times when part-time students can visit the library

- student's limited time available to spend in the library allows less time to learn information handling skills by trial and error and to compensate for inadequate services - *e.g.* to 'keep trying' to find books or to queue for photocopiers
- student's limited time available to study in the library means reference only copies solve fewer problems
- weekly cycle of visits to campus makes loan periods of less than a week of little help; for distance learners short loans are useless.

This can be summarised by saying that the devices libraries have adopted to deal with large numbers of full-time students (*e.g.* short loan collections, reference copies) are less useful to part-time students. Yet uptake of loans from special collections for part-time students has been uniformly disappointing in many institutions. An experiment in one institution with 'book leasing' to replace student purchase of books also failed.

Some non-traditional students have one advantage: some have access to employer funds or libraries, and if living further away they may have access to public libraries where there is less competition for academic books (where they are available).

Potential solutions which have had some success in different universities

Library-based

- Library staff with specific responsibility for services to groups such as part-time or distance-learning students - provided service is well-publicised.
- Special services - *e.g.* Library staff locating books and copying periodical articles for evening or distance students; more information handling skills tuition.
- More flexible loan regulations - *e.g.* giving particular groups of non-traditional students longer loan periods than conventional students.
- Longer opening hours - but this only helps some students.
- Giving greater financial priority to books and staff availability rather than additional study places.

Institution-based

- More funds for the library to buy more lending copies.
- Very explicit advice from lecturers about reading to be done.
- Better liaison between lecturers and library at planning and delivery stages.
- Making room in courses for information-handling skills tuition and regular library visits (UNN has a regulation that ALL part-time courses should have at least 30 minutes 'library break' each week).

- More use of pre-packaged materials such as course readers - the OU is the classic model for this. Individual institutions have found the costs of preparation and maintenance very high, and collaboration seems slow to take off.
- Use of IT-based sources accessed remotely - but this must include arrangements to provide the means of access.
- Recognise that 'more student-centred' learning transfers more load onto the library.
- More realistic 'Open Day' briefings from admissions tutors!

(Joan Day and Ian Winkworth, 3 March 1993)

Electronic copying of copyright works: second interim report of a Publishers Association working party on electro-copying of copyright materials

PA working party on electro-copying of copyright materials

Contents

- Nature of electronic reproduction
- The law on electro-copying
- Methods of control
- Systems for control of electro-copying evaluated
- Appendix 1: The law on copying

Preface

This second interim report begins to develop a first report, *Control of Electro-Copying*, which was designed to consider the applicability to 'electro-copying' of collective blanket licensing, of the kind practised for photocopying of copyright works. It concluded that electro-copying is significantly different from photocopying, in that it enables works to be stored in and reproduced from an electronic store, so in itself creates a significant republishing resource for which collective licensing of a total repertoire with standard fees per copy made is inappropriate. Electro-copying offers such republishing potential that it enables users to create new compilations of works, similar to works put onto the market in commercial electronic forms, and the methods of control needed therefore approximate more closely to the various contractual forms of control used by electronic publishers. As with electronic publishing, however, reproduction of works through electro-copying processes often takes place privately, and involves considerable problems of detection and control. This major problem for electronic publishing and for electro-copying requires new methods for authorising reproduction and

paying for use, which will require new forms of cooperation by users and professionals in the information distribution chain. This second paper therefore reiterates that electro-copying is not, and cannot be, permitted under blanket systems of collective licensing, and explores alternative methods of licensing and control. These will include contractual conditions of use imposed by the original publisher which run with the work under the copyright system, and authorisation of use by agencies and brokers on terms which may be different for each work, each type of use, and the extent of the copying.

1 Nature of electronic reproduction

1.1 Electronic media are becoming an increasingly common form of reproduction and dissemination of copyright materials. They are, of course, already well established for the dissemination of reference materials and topical information which require constant updating, to which access is needed promptly, and which have a high search requirement, such as financial market data. They are also being used increasingly for materials which are needed less promptly, but which have a high volume and search requirement, such as the published results of academic and commercial research, and they are now also being used for entertainment materials through 'electronic books'. Electronic reproduction also offers a new means of arranging and presenting published and printed copyright works for use in education and training. Thus, it is technically possible and increasingly common to scan, store and reproduce published materials for use in class texts and anthologies, drawing upon a range of materials; these materials are sometimes known as 'customised texts'. When stored in character-encoded form (and to a lesser extent when stored in image form) the work can also be manipulated, so that the nature of the work itself can be changed. This facility causes major problems for the authors and publishers of the works which are 'electro-copied', in that their ability to earn proper rewards for their skill and investment in the work are seriously damaged.

1.2 The forms of these electronic media are highly varied. Information may be stored on a database from which it can be accessed by 'on-line' subscribers dialling into the database. This form enables a record to be kept of the information searched and retrieved by particular users for charging purposes, though subsequent use of downloaded materials or printouts (which may now closely repeat the quality of the original text) may of course go unrecorded. Alternatively, materials may be distributed by CD-ROMs (read-only), and, increasingly, by interactive compact disks, CD-I, which gives the user a higher level of interaction with the texts. Other forms of dissemination include the different forms of disks (video and laser), floppy disks, audio-cassettes, *etc.* In this 'distributed' form, the use is under the control of the user, so that it is not generally possible to record the actual uses made without the full cooperation of the user, and while it is or may be possible to include technical barriers to reproduction which prevent some unauthorised forms of use, these have to be compatible with the actual purpose of the electronic publication. Further, with distributed electronic materials of this kind, it is relatively easy to make illicit electronic or printed copies of the entire materials so that they can be shared with other users. Or materials may be selected from different materials, including printed media, to create a new information resource, for example the customised texts referred to above.

1.3 A good deal of thought has been given in recent years to how this storage and use of copyright materials can be controlled to enable the benefits of the new technologies to be

realised, while at the same time permitting the originators and authorised publishers of the materials to obtain a fair reward for and return on their investment, enterprise, management, and skill, which are often very considerable. Without such reward and return, the willingness and ability of authors and publishers to prepare and distribute valuable information and ideas in all their forms must rapidly diminish, to the substantial disadvantage of the public. People who create their own materials and store and reproduce them in this way of course enjoy their own copyrights in what they produce (in both the work itself, literary, graphical or musical, and in the compilations they may create of their own works), but in so far as they use the works of others, either to copy them into and reproduce them from an electronic store, they are using the copyrights owned by the creators and their publishers, and so generally require their authority. And in so far as they draw on compilations (for example, databases and anthologies) made by others, they are using the copyrights in the compilations, and similarly require authority.

1.4 *Private electro-copying* The facility for users to make under their own control 'electro-copies' of copyright materials creates a new dimension to the problem. Electro-copying, as the process of using a scanner, which may now be a relatively inexpensive piece of machinery, to scan printed materials and to store the text in either character-encoded or image form, has been called, enables copyright materials to be stored and indexed in a database, from which it can be accessed and reproduced at will in either electronic or printed form. It thus offers considerable opportunities for infringement of copyright, both of the 'economic rights' - the rights to commercial exploitation - and of the 'moral rights' of the author, principally the right to maintain the integrity of the work. Further, it enables materials to be edited and otherwise manipulated - with a high level of sophistication in the case of character encoded materials, but with a considerable facility even in the case of materials stored in image form, so that the text may be changed, the whole or excerpts selected, and annotations and indices added, and the edited and changed materials can be reproduced either singly or in quantity, for example in some form of compilation, for various uses.

1.5 Privately made electro-copies can therefore compete not only with the author's and publisher's copyrights in the printed materials, but also with their own commercial exploitation of the copyright work through electronic media, which may aim at the same market as that supplied by 'privately made' copies. [In this context, 'private copying' is seen as copying by bodies not primarily engaged in publishing for sale, for example educational institutions and libraries, commercial companies reproducing materials for internal use, and governmental authorities, as well as by private individuals. Such bodies may, of course, charge commercial prices for the materials reproduced].

1.6 *Problem shared with electronic publications* Indeed, the process involves the same problems as those involved in the protection and use of commercial electronic publications, which, having been put on the market, are subject to relatively easy private copying of the electronic forms. The various methods of control for both electronic publications and electro-copying may therefore be similar, and it is important not to set precedents for private copying that may then distort the market for commercial electronic publications.

1.7 *Different from photocopying* In its simplest form, electro-copying may seem to perform a function very similar to photocopying. Thus, it may be used to make a slavish reproduction of the original text, equivalent to a photocopy. However, the added sophistication of the

process, by enabling copyright works to be included in incremental electronic stores, in which they are indexed and become easily accessible, provides an added resource which makes it distinctly different from photocopying. Thus, while reproduction by photocopying of copyright materials may be controlled by one or another form of blanket collective licensing (see below), the scope offered by electro-copying makes it significantly different, and a significantly greater threat to copyright. Copyright owners are therefore likely to see it as crucially important that electro-copying does not become established as an accepted means of reproducing materials for private use (let alone for reproduction for commercial sale), and does not become confused with photocopying, or as being permitted under the various licences issued to permit photocopying on established conditions. The processes are distinctly different, and the fact that, at its simplest, electro-copying can produce a result similar to photocopying does not mean that the two processes should be seen as the same.

1.8 Potential solutions The purpose of this paper is therefore to consider the various methods that may be available for the control of electro-copying of printed materials, and also of private copying of electronic publications themselves. The ultimate solutions depend, of course, on the decisions of individual copyright owners (which term includes their licensed publishers and their assignees) as to how they wish the use of the works they have published to be controlled. The contractual terms they impose, which, under copyright law, may run with ownership and control of the work and not be limited to situations in which there is privity of contract, may range, except where copying is permitted by the very limited statutory exceptions provided by law (as to which see Appendix 1), from requiring an individual licence to be granted in each case, with no copying permitted without such licence, so that any unauthorised act of electro-copying becomes an infringement of the copyright and subject to the penalties provided by law, to including permission to make electro-copies within some form of general licence, to, in rare cases, having no objection to the free and uncontrolled making of copies. It is the conclusion of this paper, however, that over-general collective licensing would be fundamentally damaging to the interests of authors and publishers, including publishers who publish electronically, and will not find acceptance. Potential users of electro-copying should therefore take note of the facts that electro-copying is not permitted under the licences issued, for example by the Copyright Licensing Agency Ltd in the United Kingdom, for the control and use of photocopying of copyright works, and that copyright owners and publishers may not be prepared to grant licences to make electro-copies at all. [The making of a simple facsimile copy, without any intervening storage of the contents, and without any downline transmission of data, through a single 'fax' machine would however generally be accepted as the equivalent of photocopying, not electro-copying]

1.9 End user licensing not automatic The situation is complicated, of course, by the fact that electro-copying of copyright materials often takes place in private and may not be detected. Further, publishers may not wish to be involved in countless applications for minor instances of electro-copying, few of which are of commercial value. A fair response to such minor applications may well be that the publisher is not prepared to grant a licence at all for such minor electro-copying, and to point the applicant to the availability of permission to make *photo*-copies (not stored electro-copies) of copyright works under the conditions of a CLA licence, which is specifically designed to cope with the need for minor instances of copying, and which should be adequate to meet the general needs of users for copies for private use and which do not compete fundamentally with the sale of the original published work. But the fact that infringement may be undetected should not be seen as an excuse for undertaking the

infringement, and the fact that an infringement is small in scale does not make it any more honest. Copyright owners believe that they are entitled to rely on the integrity and the cooperation of the principal bodies likely to want to make electro-copies, almost all of which rely on honest dealing and the encouragement of integrity themselves, not to infringe their copyrights or to encourage infringement by others. On this basis, they hope it may be possible to develop systems which do facilitate the use of the resources offered by electro-copying on terms which meet the needs of both copyright owners and publishers and the users, and which produce a fair return on investment in the preparation and dissemination of copyright materials. Such solutions may involve some forms of collective administration of individual licences specific to each work, and new forms of cooperation within the chain whereby information is made available to users to ensure that dissemination of information operates to the benefit of all those involved in providing and using it.

2 The law on electro-copying

2.1 Within the United Kingdom, literary works (which include all forms of original writing or speech in fixed form), computer programs (which are treated as literary works), published editions of literary works, and compilations of works, are protected against unauthorised copying and publishing by the Copyright Act, 1988. Other countries have similar legislation, which must generally comply with the minimum standards of protection under the Berne International Copyright Convention. Under the Convention protection is accorded to works from other signatory countries on the same terms as accorded to nationals. The essential requirement of the Berne Convention is that authors shall enjoy the exclusive right of authorising the reproduction of their works, and that national laws providing for exceptions to this principle in certain special cases shall not conflict with the normal exploitation of the work and shall not unreasonably prejudice the legitimate interests of the author.

2.2 The UK Act provides specifically that storing the work in any medium by electronic means (s.17), and that making adaptations of the work (s.21), without the licence of the copyright owner, are infringements of the copyright. Thus, copying a work into an electronic store, and reproduction of the work either on a VDU or printer, are restricted acts controlled by copyright. In general, conditions of use of a work run with the work, so are enforceable against third parties obtaining copies of the work (s.2, and see in particular s.56). The 'moral rights' enjoyed by the author (ss.77-89) provide rights whereby the author can claim authorship, insist on the integrity of the work, and prevent false attribution of a work (*e.g.* a work adapted without authority) to the author.

2.3 *Permitted exceptions* In the UK Act, the various exceptions (the permitted acts) are set out in ss.28-76. In the context of electro-copying, these are in general exceptional facilities to undertake limited copying for educational, library or some official use, and the relevant provisions are summarised in Appendix 1 of this paper. The basic exceptions are i) that a user (a reader) may undertake 'fair dealing' with a work for the purposes of research and private study (s.29) or of criticism, review or news reporting (s.30); in the first case, this is generally interpreted as meaning that the reader may make a copy of limited passages from a work he or she is using for the purposes of personal retention (which may be on a computer) but which must not amount to systematic copying for different persons, and in the second, as meaning

that a commentator may copy illustrative passages; and ii) that librarians may make a single copy of a single article from a periodical or of a reasonable proportion of a book of a work for a person needing it for research or private study, in return for a payment of the cost of making the copy; again, systematic provision is not permitted. The Act does not therefore generally permit copying for classroom use or for inclusion in an anthology, and in general the act of storing the work in a store, from which it can be easily reproduced, is likely to infringe the prohibition of systematic copying. The Copyright Act therefore gives strong protection to copyright owners and users with regard to electronic copying.

2.4 Other jurisdictions have similar legislation, though it should be noted that US provisions for educational copying are different, so that US solutions in this area may themselves need to be different. However, the thrust of different laws are similar, and require the permission of the copyright owner before a work can be copied into an electronic store or be reproduced from such a store.

2.5 *Importance of copyright to society as a whole* The purpose of copyright is, of course, not just to protect the originators and publishers of literary works, but to operate in the public interest by making the work of such originators available on the market and to the public, so that it can be used for economic and social development. The system therefore sets up a trading environment within which fair economic returns can be obtained from the use of copyright works, and the originators may enjoy fair earnings based on the value of their work and the uses that are made of it. Without such a system, the availability of informational works on the market would quickly dry up, to the significant detriment of the public, including of course education, commerce and research. There is therefore a common interest in making the system work, and indeed the system has been well described as a circle within which people draw on the works on others and generate their own outputs for the public benefit.

2.6 In this connection, two comments may be of interest:

2.6.1 It is, of course, perfectly possible for educational institutions, company information services, and libraries, to create their own electronic stores of their own copyright works. But when such works are required for publication, and need to be promoted and marketed to obtain a fair return on the investment required, it is a normal development for a commercial publishing department to be established to undertake this work, which has to justify its own commercial existence by earning a fair return. At this stage, therefore, the interests of the public body and commercial publishers tend to coincide.

2.6.2 Information is a vital product of greatly varying value to its owners and to users. At one end of the scale, it is a commodity which is freely given away, for example for publicity. At the other, it is of such value that it is carefully guarded against any dissemination at all. Any system which is established to facilitate the distribution of information on a significant basis must be able to reflect these different values, and secure returns based on individual value, not just on a basic unit value of information.

3 Methods of control

3.1 *Need for variety* As noted above, methods of control of private reproduction of both electronically published and electro-copied materials will vary widely, according to the type of publication, the market for which it is intended, and the means of reproduction itself. Thus, a publisher of materials sub-licensing them for reproduction and sale as a disk or smart card for use as an electronic book will require that no reproduction whatsoever should be permitted, as the electronic product is the product intended for the use of the consumer. In this respect, his situation is similar to that of the manufacturer of sound recordings, who faces similar problems, though with the possible benefit to the publisher of literary works that while it is relatively easy to copy sound signals onto tape (and eventually onto compact disk as well) the electronic book uses a graphic image which needs to be reproduced onto a similar convenient format. So while private copying of sound recordings has become so common that the manufacturers are having to plead for a levy to be imposed on the sale of the tapes that are used for the illicit reproductions, and are looking for technical blocks to be imposed on DAT copying, the book publisher is likely to be concerned that the habit of dubbing copyright literary works from one format to another should not become established at all. Thus, he is likely to demand a number of safeguards as conditions of the licence to reproduce the materials in electronic book format: for example, that a technical block to reproduction is incorporated in the electronic medium, that the medium should have printed on it a clear prohibition of copying, and that the licensee should join with the licensor in taking legal action against any form of illicit reproduction.

3.2 *On-line databases* The publisher of an on-line database has probably the best level of control, in that he can incorporate two safeguards: i) he can record instances of accession to the database, and the value and extent of materials accessed, and ii) in respect of distributed materials, he can reserve a valuable part of the information to be accessed only on-line. But once the material has been downloaded by the user, he has lost control, and is in the same position as the publisher of printed materials that have been electro-copied.

3.3 *Private copying* The publisher of printed materials which are vulnerable to electro-copying, or of distributed electronic publications, has the greatest problem. While it may be technically difficult to download materials from some forms of reproduction, the technology is advancing rapidly, and this sort of inhibition may quickly diminish. At the same time, while new forms of technical blocks to copying of electronic materials may be invented, these would not apply to electro-copying of printed materials (though there could be forms of paper or ink which resisted photocopying or scanning), and in many instances the specific intention of publishing may be to allow materials to be printed out by the user, on condition that the user does not download the materials to another store or make them available outside the scope of the licence for use. In such cases, the insertion of technical blocks to copying are self-defeating.

3.4 *Materials intended to be copied* A further form of electronic reproduction has the specific intention of permitting the user to make printed or electronic copies within the terms of a licence of use. Thus, some publishers are now producing anthologies of educational materials which schools and colleges are allowed to select and reproduce at will, within the terms of the licence of use. In this case, the problem comes in ensuring that the terms of the licence are enforced. This is a problem that arises with the various *corpuses* of literature

being established by researchers in linguistics: the very purpose of the very comprehensive database is to allow analysis and reproduction of selected materials for the purposes of the research, but the database itself becomes a very valuable database of published materials which could be used for many purposes other than that of the intended research.

3.5 *Single system inappropriate* The very variety of these different forms demonstrates that it will be extremely difficult to arrive at a single common system of control. This is further complicated by the different circumstances of different publishers. A wholly electronic publisher will want to keep very close control of his published works. By contrast, a small general publisher may not anticipate serious damage from electronic reproduction, and may not want to devote resources to its control. Such a publisher is more likely to be satisfied with a collective solution of some kind, whereas the publisher of works in electronic form, or the publisher of works most vulnerable to damaging electronic copying, will want to keep strict control, and to operate only within a system which allows him to get a proper return for the value of the works copied, and the frequency and extent of the copying.

3.6 In arriving at possible solutions, it is also necessary to look at the different types of market for works, and the circumstances in which they may wish to make copies. These would seem to be principally as follows:

3.6.1 Private individuals, mainly concerned with electronic books, but who may also want to store reference materials electronically published, such as timetables and recipes. The interest of the copyright owner publishing such works for gain is likely to be largely in preventing copying for others, rather than copying for the original subscriber's own use. In some cases, indeed, the publisher may expect the output to be copied. The control of this form of genuinely private copying presents particular difficulties.

3.6.2 Schools, colleges, and training establishments producing pedagogical materials, seeking to draw both on specially produced text books and materials to be used for illustration and analysis. Photocopying of such materials has been allowed under blanket collective licences on terms that are reasonably generous to the user, but the added facility of electro-copying or electronic reproduction of electronically-published materials makes such solutions unsatisfactory and inadequate.

3.6.3 Academic and commercial researchers, concerned to have access to the body of relevant research materials, and to be able to search them and then reproduce them for retention. In the case of printed published research materials, electro-copying offers the danger that users may copy the original published input and reproduce it from the store, so that the number of subscriptions to the printed journal, for example, becomes greatly reduced, thereby losing economies of scale and leading to higher prices, in an upward spiral. In the case of electronically published materials, the licence for use may permit such uses, against consideration of adequate payment for such use.

3.6.4 Libraries, seeking to provide improved access to materials for their users, and to save on shelf-space for conventional books and journals. Once materials are stored electronically, such bodies are then able to make them available to other users on networks, or download them for further distribution.

3.6.5 Authorities, such as governmental and legal institutions, seeking the cheapest possible access to published materials.

3.7 The principal concern in this paper is not with the control of materials electronically published, for which different forms of end-user licence will usually set out the limits of what can be done with the work by the user, but with controlling copying by 'private' users, principally by electro-copying.

3.8 It is important to realise, first, that the copyright owner may decide that such use runs so totally contrary to the legitimate marketing of a work through normal channels that he does not want to permit any such private copying at all, and that this is a legitimate business decision. The fact that electro-copying is possible, and may give the user a greater facility to use the work, does not mean that such use must be legitimised by the owner. Nor does the fact that private electro-copying is difficult to control mean that it is sensible to permit it through a licensing system that is regarded as bringing in inadequate returns: a copyright owner may well prefer to take his chances of detecting and preventing illicit use of his work than to permit under-rewarded copying which, in his view, damages his legitimate market. And nor does the fact that a potential copier is a desirable educational or research institution mean that electro-copying should be permitted at low cost: educational materials generally have to be paid for, and there is no reason why this should not apply equally to published educational works. A copyright owner may choose to make his works available cheaply to education, but he should not be compelled to do so.

4 Systems for control of electro-copying evaluated

4.1 As noted above, in its simplest form electro-copying has been compared with photocopying, in that it can be used to produce a facsimile reproduction of a printed page without other added value. This has led to suggestions that the blanket collective licences in operation to permit limited amounts of photocopying to be undertaken by schools, colleges, universities, commercial organisations, government departments, and document supply centres should automatically be extended to electro-copying.

4.2 *Blanket licences inappropriate* Typically, such blanket collective licences are operated by collecting societies established on behalf of authors and publishers and enable users (the licensees) to make photocopies in limited numbers of limited parts of all or most copyright works (the repertory), in return for payment of a standard fee per page copied, which may vary according to the type of licence, the amount of copying undertaken being measured by some sample of the total constituency. This provides a very convenient facility for users at reasonable cost, particularly for education. Such a system is operated in the UK by the Copyright Licensing Agency Ltd.

4.3 However, in spite of the value of such a licence, photocopying remains a relatively crude method of making copies, so that the facility is limited to making slavish reproductions. The system of payment is also relatively crude, providing only for marginal variations for the value of different materials copied, and only rough measurement of the economic or commercial value of the total materials copied. The system may serve a need, but is unsuitable for control of and remuneration for uses which conflict more directly with the commercial product than

photocopying (though it should be noted that photocopying is now used to produce some very sophisticated products, such as college anthologies used for teaching, which go beyond the intentions of the blanket collective licences which are available for minor instances of photocopying).

4.4 In particular, as set out above, electro-copying provides a sophisticated resource for the storing, accessing, manipulation, and reproduction of texts, which enables it to be used to produce resources which are drawn from and compete with commercially produced texts. It is clearly of crucial importance to copyright owners that this form of reproduction does not become accepted as merely another form of photocopying, available to users through cheap collective licences which diminish control and provide inadequate rewards to originators. Further, under the system of blanket collective licensing, it is not apparent that extending the facility to electro-copying would result in any increase in revenues, as the copies to be made would presumably replace permitted photocopies, and would generate only the same fee as that due for the photocopying. (A larger fee would certainly lead to demands for a wider facility). And to seek to limit any extension of the photocopying licence to slavish facsimile reproduction only would merely legitimise the use of electro-copying as a means of making copies, while enabling the much greater facility offered by electro-copying to be used outside the terms of the licence, but with less likelihood of detection (because outputs would usually be indistinguishable from licensed photocopies) and with inadequate rewards.

4.5 Many copyright owners would therefore object strongly to reproduction of their works by electro-copying being permitted as though it were photocopying, and will insist that the first stage of control must be to establish the intrinsic illegality of making copies by electro-copying, as a base from which more satisfactory systems can be established.

4.6 *Individual licensing* The normal method of control for significant forms of exploitation is by individual licensing by contract, with each particular grant of the right geared to providing what is perceived to be an adequate reward, and with the terms of the licence running with control of the work. Licences are not granted for uses which compete with the licensor's own product except on acceptable terms. Copyright owners will clearly wish to retain this form of control and remuneration for uses which are contemplated as bringing in significant commercial returns.

4.7 *Collective administration* However, between these two possibilities there are the many cases in which users may wish to make relatively small amounts of electro-copies, which the copyright owner does not see as bringing in a sufficient commercial return to justify an individually negotiated licence, but which, combined with many other similar uses, does constitute a threat to his market. Or the copyright owner may regard granting permission to make electro-copies as a useful means of exploitation. He may, of course, decide that he is not prepared to permit any such use, in which case users cannot legitimately make electro-copies, though the owner may indicate that he has permitted the making of photocopies (not electro-copies) through the CLA licence, which should provide an adequate facility to meet needs for minor copying.

4.8 To avoid the needs for users to have to apply to many varied sources for such permissions, and for publishers to have to deal with many applications for small permissions, it is likely that systems of collective administration of individually controlled rights, with each

owner/publisher remaining free to determine the terms of use, and with users agreeing to pay the appropriate fees through the central mechanism, will be established. These might involve the interrogation of on-line databases specifying and recording the agreed terms, or, in the absence of this technology, a similar telephone system to a central point. There is no particular reason why this facility should be centralised in one single agency, and 'information brokers' providing information on demand with the consent of the copyright owner, and charging appropriate fees which include a royalty for use of the copyright work, are already established, and are likely to serve different markets, working to some extent in competition with each other. It must be for the publisher of the original work, in printed or electronic form, to decide whether to license any such agency to provide copies of the works published by him, and to establish the terms in the market place. In general, publishers are likely to look for returns that are similar through different agencies, so that any variations in price are geared to such market factors as volume, quality of service, *etc.* The established reprographic (photocopying) rights agencies, and bodies currently providing photocopies under apparent statutory rights, such as the British Library Document Supply Centre and other libraries, may well be suitable agencies, though the system envisaged would require significant changes in practice towards schemes reflecting commercial and legal realities. Such systems are also being planned in the United States for the licensing of materials for inclusion in customised texts for college use (though not necessarily involving the use of electro-copying with its permanent store aspect).

4.9 Under such systems, a central database would be maintained listing works which the owners are prepared to make available for electro-copying, and which contains details of the terms on which electro-copying could be undertaken (which could be sets of 'standard' terms to which individual licensors could subscribe). The database would be interrogated by registered users who would agree to declare the copies they had actually made, and to pay the appropriate fees. The fees would be payable to the central administrator, so avoiding the need for multiplicity of payments, and the central administrator would then pass the fees earned, less an administration charge, to individual licensors. The system, like all systems of collective control, involves considerable reliance on the integrity of users, and would therefore require adequate audit systems.

4.10 *Distribution centres* Another system involving a different approach would be to establish licensed electro-copying centres in different localities or sectors. This builds on the idea that bodies such as libraries and educational resource centres, instead of seeing themselves as agents for users in obtaining required information, would see themselves as a last link in the information provision chain, providing copies of licensed works on demand in return for the fees specified by the copyright owners, and retaining a commission on fees charged which would be an essential part of their own income. For this system to work, it would clearly be necessary that the centres should be independent of the final users, as otherwise the commission becomes merely a reduction of the user fee, and the user body lacks the incentive to achieve the maximum income on behalf of the copyright owner. Such centres could provide copies in either printed or electronic form, and the building up of a store of materials would become a positive advantage in effective marketing through the new technology of electro-copying.

4.11 Other possible systems will no doubt commend themselves. At this stage, it is probably most appropriate only to list the criteria against which possible schemes can be judged. These would seem to include:

4.11.1 The system must provide a fee which adequately reflects the varying value of materials.

4.11.2 The system must adequately reflect the volume of copying which takes place under it.

4.11.3 It must not conflict with normal means of commercial exploitation of the work.

4.11.4 While any such system requires a high level of integrity on the part of users, it must be capable of being adequately monitored.

4.11.5 The system must not involve such complex administration that, in practice, it is by-passed.

4.11.6 Thus, in particular, users should be able to pay fees to a single (or only small number of) bodies, to avoid undue difficulties in making payments.

4.12 As noted above, it is unlikely that a common system will be achieved for electro-copying. Different copyright owners will need different systems to meet the needs of their publishing programmes, and different systems will be appropriate to different markets. A level of individual control will be required, and it is crucial, in the interests of the continued provision of high quality information through a pluralist publishing system, that the provision of information and copyright materials is not forced into a common mould providing for standard fees under an unduly collectivised system.

4.13 If established, such systems might also be appropriate for controlling the use of electronically published materials through libraries and similar bodies, at the option of copyright owners.

(13 January 1992)

APPENDIX 1: THE LAW ON COPYING

The Copyright Act, 1988, provides in s.16 that: (1) The owner of the copyright in a work has ... the exclusive right to do the following acts in the United Kingdom - (a) to copy the work ... (2) Copyright in a work is infringed by a person who without the licence of the copyright owner does, or authorises another to do, any of the acts restricted by the copyright ... (3) References in this Part to the doing of an act restricted by the copyright in a work are to the doing of it - (a) in relation to the work as a whole or any substantial part of it ...

s.1 provides that copyright is a property right which subsists ... in ... (a) original literary, dramatic, musical or artistic works, ... and (c) the typographical arrangement of published editions.

'Substantial part' is not defined in the Act, but has been interpreted by the High Court to the effect that the quality, not quantity, of the extract made is the relevant criterion, and that that which is worth copying is, by definition, a substantial part.

ss. 28 to 50 set out the various acts permitted by the Act in relation to copyright works. They may be briefly summarised, for the making of copies of literary, dramatic, musical or artistic works, or of the typographical arrangements of published editions, by photocopying or electro-copying, as follows:

s.29 - Fair dealing: 'Fair dealing' permits the making of such a copy of a work or part of a work (or a typographical arrangement) for purposes of research or private study, or for criticism or review, as is 'fair dealing' with the work. 'Fair dealing' is difficult to define, but is generally making such use of a work as can be anticipated as part of the usual process of using the work, *e.g.* copying extracts from it as notes for retention, or to illustrate a point in a report or review. So while the user would be permitted to enter extracts into his/her computer file for retention and subsequent reference, this would not extend to copying extracts intended for multiple reproduction or to be issued to members of the public (*i.e.* other users), whether or not for sale. Further, the person making the copy may not engage in 'systematic' making of copies or copying for multiple uses, as defined.

s.32 - Use for instruction or education: The provision of the Act which permits the making of copies for this purpose does not extend to copies made by means of a reprographic process, which includes copying by electronic means.

s.33 - Anthologies for educational use: This exception permits only the most limited making of copies, restricted to short passages of a work not itself intended for use in educational establishments in a collection intended for use in an educational establishment, consisting mainly of material in which no copyright subsists, with severe limitations on the number of excerpts from works by one author.

s.36 - Copying by educational establishments: This provision permits educational establishments to make copies (including reprographic copies as defined above) of up to 1 per cent of a work in each quarter when licences (not

limited to collective licences) are unavailable. This is very much a minimal fall-back provision.

ss.38 and 39 - Copying by librarians: Librarians of prescribed libraries (non-profit public, academic, school) may make a single copy of a single article from a periodical or of a reasonable proportion of other published works for persons wanting them for research or private study, and who pay the costs of the production of the copy, again not extending to 'systematic' making of copies or copying for multiple use. Electro-copying must, by definition, usually infringe this last rider.

It should also be noted that the Copyright Act restricts the making of adaptations of a work (s.16) and infringing the moral rights of the author (paternity, integrity of the work, and false attribution of a work to a person (Chapter 4)), all of which restrict the ability of users to alter a work stored electronically.

Reprography, electronic copying and document delivery: licensing options

Publishers Association

The underlying assumption of copyright law is that only the copyright owner, or a person (natural or legal) authorised to do so by the owner, may authorise the making of copies of copyright works. The only significant derogations from this, in the context of photocopying and related technologies, permitted within the restraints of Article 9 of the Berne Convention, are those which permit a user of a copyright work to make the normal uses of the work contemplated by the parties (*e.g.* extracting copies of passages for personal retention) (so-called *fair dealing*), or which (under UK law) permit librarians of certain types of non-profit libraries to make single copies of either a single article or a reasonable proportion of a book for a person who needs the copy for research or private study, and who pays the production cost of the copy. In neither of these cases is systematic copying of the same work or part of a work permitted, and this militates against the exceptions being used to justify the making of copies into electronic stores, which by definition are designed and likely to be used for the making of numbers of copies as they are required.

In recognition of new forms of reproduction which are controlled by users, various forms of collective licence have, however, been permitted by copyright owners and the bodies representing them to permit users to make limited copies with minimum inconvenience, and this paper explores how such systems might be developed to permit the uses of new technologies, such as advanced photocopying techniques, scanning and loading literary works into computer stores, and possibly reproduction from electronically published materials, by users on a fair basis, producing proper returns for the copyright holder(s) in respect of the uses made of their work(s).

In all cases, the proposed or actual systems remain capable of being over-ridden by the copyright holders, and it is a basic assumption of all the proposals that the copyright holder, if he/she prefers, may reserve control of the work so that any copying can only lawfully be done under individual licence or permission.

The initial section of the paper seeks to define a number of terms so that these can be used thereafter with the minimum misunderstanding.

The language of this paper is intended to be in legally correct but not in definitive legal drafting form.

Definitions

Copyright holder: the person (legal or natural) with the legal authority in respect of a particular copyright work to authorise the making of a copy of the work. This may include the author *or*, when appropriate assignments or licences have been granted (as is usual) the publisher, in respect of the copyright in the literary work, *and* the publisher, in respect of the right to authorise the making of facsimile copies of the typographical arrangement of the published work.

Literary work includes any works, written, spoken or sung, in fixed form, and includes tables or compilations (including a database compiling a number of works) and computer programs. Artistic, musical and dramatic works may be subject to similar conditions governing reproduction.

Licensee: A person (legal or natural) authorised by licence to make and/or publish a copy of a copyright work. (Such licences do not of themselves permit a licensee's customer to make copies of the copy (including the making of photo- or electronic copies) unless the licence specifically confers the right to grant such ongoing rights, so that such customers need their own appropriate licence if they are to be able to make such further copies legally).

Right: The right to make and/or publish copies of a copyright work.

Permission: Authorisation to copy for limited purposes, *e.g.* to include a quotation from a work in another work, but which does not confer the right to authorise the making of further copies.

Collecting society or agency: An agency licensed by copyright holders (or by statute) to grant licences for the making of copies under a collective or blanket licence, and to collect, account for and distribute appropriate fees (usually a standard fee providing equitable remuneration), in respect of all copyright works of a particular class which are not specifically excluded from the collective licence.

Licensing agency: An agency licensed by copyright holders to grant licences to make copies under a general licensing arrangement, and to collect, account for and distribute, appropriate fees, in respect of copyright works specifically authorised to it by the copyright holder (opted in).

Document delivery service: A service licensed by copyright holders (or authorised by statute) to make and distribute copies of copyright works to its customers, in the form of either written or electronic copies.

Electronic store: A device, directory or database into which a copyright work is loaded. For the purposes of this paper, such a store includes only storage devices which retain a copy more

than transiently (*i.e.* when the copy is not automatically replaced in the store by the next copy which is loaded, but is stored with a file name in a directory).

Personal directory: An electronic directory used for computer file management purposes by an individual who has effective control of the contents of that directory.

Network directory: An electronic directory used for computer file management purposes generally available to all users of a network.

Photocopy: A copy on paper made by a light, heat, or laser process from a paper copy, which does not involve the storage of the work in an electronic store, as defined. It may therefore include a copy made by facsimile transmission (fax).

Electronic copy: A copy in electronic form (*i.e.* held in an electronic storage device) made either from a paper copy or another electronic copy, *and* a paper copy made (printed out) from such electronic copy. The electronic copy in the store may be either in image or character-encoded form.

Electronic publishing: Putting onto the market, in either on-line or distributed form (*e.g.* CD-ROM), copies in electronic form.

Manipulation of text: The process of changing the format and the content of textual or graphic materials to give a different presentation or meaning.

Possible licence types

A. Collective (blanket) photocopying licences For the making of limited numbers of photocopies of limited parts of copyright works, collective blanket licences are available from the Copyright Licensing Agency (CLA), a collecting society or agency which operates as an agent for copyright holders. Such collective blanket licences are available to, *e.g.* schools, colleges and universities, research institutions, business organisations, government and local authority departments, and, subject to certain additional restrictions, document delivery services and copying shops. Copying in excess of that permitted by the collective licence may be authorised by the individual permission of the copyright holder, or under special arrangements whereby CLA (or some other similar agency) operates as a permissions agency (*e.g.* CLA Rapid Clearance Service (CLARCS)) - see B below.

The principal characteristics of these collective blanket licences are as follows:

- They cover all literary copyright works published in the UK by publishers established in the UK, other than those opted out, which include certain classes of work and certain works opted out individually by the copyright holders.
- They may also include works published elsewhere, by specific agreement with copyright holders or their agents in other countries. Such extensions may be either comprehensive of works of the appropriate categories published in such other countries, or include all such works other than those opted out, or include only such works as are opted into the system by the copyright holders.

- They permit the copying of only limited proportions of the works covered, and in limited quantity.
- They permit the copying of works only for the purposes prescribed.
- They require the licensees to make and retain records of copies made under the licence, or to participate as required in auditing or sampling schemes designed to measure the volume and value of the copies made.
- They require licensees to use their best endeavours to control copying within their remit to that permitted by the licence, and to display appropriate notices, *etc.*
- They require licensees to pay an annual facility fee and appropriate copying fees, usually an equated amount based on sample amounts of copying, page prices, and number of users, to the copyright holders via the CLA.
- The CLA distributes such copying fees, after deducting its administration costs not covered by the facility fees, to copyright holders, either under agreed block distribution arrangements or individually.

For special arrangements permitting the supply of photocopies by document delivery services (*e.g.* BLDSC) additional requirements may be built in, for example that the fees due, although charged at a standard rate, are directly related to the number of copies made, and that records of those copies are produced.

B. Licences for photocopying in excess of that permitted by collective blanket licences

When users (usually already licensees of CLA) seek permission to make photocopies in excess of the facility permitted by CLA licences, for example, copies of research articles to be used for marketing purposes, or copies of texts for inclusion in college anthologies, CLA, acting as a permissions agency, proposes to operate a permissions service known as CLARCS. This will permit users to seek permission through a telephone or on-line service to make copies under specific terms approved by the publisher by reference to the CLA database. A similar service may be appropriate for licensing the electro-copying of works in appropriate circumstances. The distinguishing feature of these permissions would be required to be as follows:

- Permission would only be granted in respect of works specifically authorised to be included in the system (opted in) by the publishers of the work.
- The publisher would have the facility to determine a specific fee in respect of the authorisation, and while this might be by reference to a standard or default tariff set out by CLA, the fee may be varied to suit the extent of copying of a particular work covered, the number of copies to be made, the uses to which the copies are to be put, whether the copies are to be retained for future use, whether the works are to be stored in a database for future access (which may require a separate licence on the part of the user), whether the copies are to be sold, *etc.*
- The royalty fees set for licences or the granting of permissions through different channels would need to be such as to produce similar returns for similar uses, so that there was no discrimination between such different channels.
- CLA would maintain a full record of the copies made through the permissions system, and charge a royalty in respect of all such copies.
- Because these extended permissions would be in direct competition with primary publishing of the work, the royalties determined by the publisher would be paid by CLA to the publisher, without deduction of administration costs (which would

need to be recovered by a CLA through a standard administration charge to the user).¹

- Distribution of royalties by the publisher between the publisher and the author would then be by reference to the publishing contract between them.

C. Licensing of electro-copying Proposals for various licences to permit the electro-copying of works are set out in the Appendix to this paper (not included in this volume).

D. Monitoring of compliance All licensing systems of the kinds described above involve the granting of considerable facilities to users which can readily be abused, so that, if they are to be successful, they would require considerable integrity on the part of licensees and their customers. To a degree, this integrity can be expected from the institutions likely to be eligible for such licences, which would recognise the value of the facilities offered and, it is expected, be willing to use their internal disciplinary procedures to secure compliance with the terms to which they have agreed. But it would be naive to expect total integrity. It is therefore likely to be necessary, as an essential part of the changing systems of information provision in which we are engaged, to establish some central compliance and monitoring procedures, with the co-operation of licensee bodies. Under this scenario, the central body would maintain a small inspectorate, concerned with the task of auditing and monitoring the operation of licences and detecting abuse. User bodies that wished to co-operate fully with the licensing system (and this might become a condition of licensing) would be given the opportunity to participate in this function, agreeing to comply with internal disputes settlement systems, thereby avoiding involvement in long and expensive legal cases which put the whole principle of co-operation in jeopardy.

(19 April 1993)

¹ This and the subsequent point are subject to interim arrangements during the current PLS/ALCS agreement

Information strategies

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A proposal for a modest but important Information Systems (IS) strategy initiative was supported fully at the first meeting of the JISC and at previous presentations to the funding councils at a cost of £300,000 a year.

The initiative is not intended to be prescriptive in any way, but has an objective to provide an enabling framework(s) which institutions may use, adapt or ignore as they think appropriate, in this area of increasing strategic significance and expenditure.

Most strategies in the 'old' universities have been IT-oriented and procurement driven. The aim of the initiative is to move from technology-led strategies towards information strategies. Clearly many of the issues of information architecture that are central to the Libraries Review will be relevant to the JISC Initiative. The substance of the proposal is outlined below:

The HEFCs have an overall concern about quality and value for money in higher education. The proposed initiative is to provide a framework within which both institutions and the HEFCs can seek to ensure value for money and corresponding benefit from the large investment universities are making in information, technology and related systems, possibly between 10-15% of their budgets, and where mistakes can be expensive.

The proposal is to develop a strategic framework for institutions to adopt (and adapt) for their 'information strategy', including assessment and monitoring tools. It would include suggestions for performance indicators and methods of evaluation and monitoring. Such performance indicators and methods of evaluation and monitoring. Such a toolkit could be used in a variety of ways - for self audit, to support procurement, for a focused analysis, and as input to institutional strategic reviews.

There is no suitable off-the-shelf methodology which would meet the complex and diverse requirements of academic institutions, although the work can draw on best practice and guidance material available in other sectors.

A great deal of work will be needed in the initial stages of the initiative, and it is suggested that a co-ordinator should be employed to oversee this work. A possible method of approach is as follows:

- initial preparatory work through selective interviews to develop ideas about scope, coverage and key issues, seen from a variety of perspectives; this would involve visits to a number of institutions, and enable material for a workshop to be prepared
- workshops to be run, involving appropriate teams from institutions (such as Vice-Chancellor/Principal, Pro-Vice-Chancellor, Director of IT, Librarian, Registrar, Chair of Strategy Group) to draw upon a range of experience and concerns. It will be essential to get the composition of the workshops right, as well as ensuring that the objectives and approach are understood and followed, and that task teams and other mechanisms are used to move things forward
- after the workshops, draft guidelines would be produced for comment and further iteration, which could be issued by the JISC for reaction from the wider community

It is envisaged that the following would be produced as deliverables from the initiative:

- an executive guide for top management, summarising the method, outlining the importance of an IS strategy for the institution and providing a mechanism for resource prioritisation, monitoring and regular updating; covering scope and major issues
- detailed practitioner guidelines - an outline, a practitioner manual, and a composite model - for use by the IS strategy group and potential suppliers
- follow-up workshops for awareness raising and on techniques and approaches, possibly linked to the production of training materials, or through the use of volunteer 'test-beds' for implementation

It is expected that a strategy framework should be provided through this pump-priming initiative. Follow-up, value added services, for example value for money audits, could be offered but on a charged basis.

The Committee may wish to consider whether it wishes to make further recommendations for action in the report of the Review. It is suggested that we discuss the following:

- that we should give full support to the JISC initiative and seek to ensure wide consultation with the community;
- that we should consider a supplementary recommendation which would suggest that more detailed work should be done on the particular contribution that the 'Library' could/should make, within an institutional information strategy.

Such an analysis might include identification of the steps to the virtual library, identification of critical factors in the future of libraries, library systems and other information services/technology requirements, the key future role for professionals, skills requirements,

trends in convergence, best practice and model library/information service strategies, ways of creating awareness and readiness for change, and involvement in wider information strategy work.

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New directions in the library automation industry: prospects for higher education

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Introduction

In recent years there has been a growing sense of disillusionment and frustration among academic librarians about the commercial library automation systems on offer. While there have continued to be important developments in the use of IT in libraries, notably with the introduction of CD-ROM products, the more extensive provision of workstations for student use, and the growth of networking, the computer systems which support most library activities and which represent the bulk of the library's investment in IT, have seemed moribund.

A decade ago, the new library automation systems which were then becoming available seemed to offer many solutions, capable of delivering both efficiency gains and improvements in the provision of information to users. During the 1980s most academic libraries installed systems which automated, in many cases for the first time, and certainly for the first time in an integrated way, many of their core activities, such as acquisitions, cataloguing and circulation. The development of OPACs opened up exciting new possibilities for accessing information about the holdings of the library. The library automation system, whether it came from GEAC, SLS, BLCMP, CLSI, Dynix, McDonnell Douglas or any of the other major suppliers, was the centre of attention and the object of high expectation.

Now these systems seem to have been marginalised. While it is accepted that they continue to be vital when it comes to handling all the routine internal tasks of the library, nobody much looks to them to provide solutions to the problems of today. With university libraries labouring under the impact of increased student numbers and other changes in the higher education system, most attention nowadays is focused on other applications of IT, particularly the expansion of networked information. This marginalisation is well illustrated by the preoccupations of the present Libraries Review. It would not have been so ten years ago.

In some respects this may be a sign of maturity, not a cause for concern. The library automation systems of the past decade may well have largely fulfilled their potential, and while

continuing to occupy an important position, understandably no longer excite us. It is quite right, it might be argued, to give centre stage to new uses of IT instead.

But there is still that frustration and disillusionment, as if systems ought to be giving us more but are failing to do so. Here in a sense is the fundamental issue which this paper seeks to address. What is the source of this frustration, and can it be removed? And beyond that, does the library automation industry as we have known it over the last decade have anything to contribute to the solution of the problems which university libraries are facing in the 1990s, as opposed to those we faced in the 1980s?

The paper has been produced mainly on the basis of personal knowledge of the library automation industry over a number of years, but this has been supplemented through discussions with a number of leading suppliers which were arranged specifically for this purpose. On grounds of confidentiality, no explicit references have been made to development plans or other information which suppliers considered to be proprietary and not yet in the public domain. In general the paper describes general trends rather than the prospects of individual companies.

Successes and failures

Despite the frustration now felt by librarians, it is as well to remember the considerable benefits which have been gained from library automation over the last decade. Without doubt the integrated automation of basic internal processes such as acquisitions, cataloguing and circulation has produced very large efficiency gains, and without this solid basis of automation, university libraries would have had no chance at all of coping with the expansion of higher education over the last two or three years.

The almost universal use of shared bibliographic data, loaded into local systems from a variety of external sources, has also been a major time-saving development, and has also produced in many cases improvements in the quality of data on offer to users. OPACs have also fulfilled a good deal of their potential. At least it is impossible nowadays to imagine a library operating without one, which is some sign of success, however much we might like to see them improved. Finally, there has been a major improvement in the availability of statistical information on the operation of the library. Libraries are better informed nowadays, even if the systems in use are a long way from functioning as genuine decision support systems.

Set against these successes, there are undoubtedly points of failure, and these are at the heart of the current sense of frustration. Three main reasons for the frustration can be cited.

First, the current generation of systems has never looked quite finished, even so far as its basic functionality is concerned. Suppliers have never quite managed to achieve the last ten per cent of functionality, perhaps reflecting in some cases the North American bias of some of the systems on offer. Frustration has been compounded when missing functionality has been promised over many years, often as a contractual commitment.

Second, the current library systems have never quite functioned with the reliability and ease of operation which users have come to expect from commercial software. In some ways this is not

surprising, since what is still very much a cottage industry has been grappling with one of the most complex data processing applications imaginable, while ease of operation has been jeopardised over the years by the slow, piecemeal development of systems.

Third, the industry in recent years has undoubtedly failed to innovate, and has proved incapable of delivering to users improvements which do not to the user appear to be difficult. The industry has established a reputation for itself of being unresponsive. Three particular areas stand out in this respect: the user interface, which on most systems has remained primitive when compared with PC or Macintosh based applications; self-service facilities, which also remain rudimentary, and the implementation of standards, which has been very slow.

In order to understand why library automation has enjoyed only partial success, it is necessary to understand more about the structure of the industry and the nature of the systems on offer. This background is provided in the following section. What we shall discover is that the library automation industry, though beset by very serious problems which have severely hampered its ability to move forward in recent years, is now on the verge of generational and structural changes which promise to remedy many of its shortcomings, enabling the industry to meet more fully the changing and expanding needs of libraries in the 1990s and beyond. In a subsequent section we shall investigate the possible scope of the contribution it might make.

The technological and industry environment

The library automation industry has existed in its present form for more than ten years. In North America it has existed in the same form for even longer. During the whole of this period the industry has been dominated by specialist suppliers offering turnkey solutions consisting of hardware, software and services. So far as the products themselves are concerned, there has been a single dominant paradigm: that of the online, modular, integrated, standalone, typically minicomputer-based system.

The library automation industry has now reached a critical point of generational change. Over the next few years it is likely that there will be radical changes in the structure of the industry, the products on offer and the manner of doing business. The object here is to clarify the trends which are forcing this transformation.

In the United Kingdom, the first generation of systems was characterised by the old mainframe-based, offline circulation systems and by offline cataloguing systems, generally based on cooperative initiatives in the public sector. Companies such as BLCMP and SLS came into being as part of this first generation.

The second generation of systems made its appearance in the UK in the early 1980s, several years later than in the United States, where this new form of automation had been pioneered in the mid-1970s by companies such as CLSI and GEAC. The second generation of systems was made possible by the availability of relatively inexpensive minicomputers whose capabilities could be exploited to the full by proprietary software. Thus the standalone, online, integrated, modular system, which for decade now has formed the standard model of library automation, came into being.

We are now on the point of moving from the second to the third generation. The second generation of systems with which we are so familiar is reaching the end of its life. It is thoroughly obsolescent.

Part of the evidence for this lies in technology. Over the past few years the computer industry has been revolutionised by a dramatic acceleration in the pace of technological development. We have seen the emergence of a new generation of immensely powerful, relatively inexpensive machines. We have seen huge advances in the database industry, with the emergence of a range of standard, high performance relational database management systems. We have seen quite astonishing progress in communications technologies, making a reality of high-speed transfer of vast quantities of text, image and sound. We have seen dramatic improvements in user interfaces, with the use of colour, graphics, windows, icons and so forth now commonplace, at least in the worlds of PCs and MACs.

The library automation industry, however, has until very recently been left behind by this. Look at the great majority of the systems on offer today, and you still find systems based on out-of-date proprietary technology. Take away the occasional gloss coat of UNIX, and what you find underneath are rusting and decaying relics of the 1970s and 80s.

However, the best evidence for the obsolescence of the current generation of systems is found not in technology but in the absence for a number of years now of genuine functional innovation. As noted in the previous section of this paper, the last major innovation was the introduction of OPACs, some six or seven years ago. From a functional point of view, the industry has conspicuously failed to meet the changing and expanding needs of libraries in the late 1980s and early 1990s.

This is what happens when systems reach their limits, when the fundamental designs of an earlier age finally become a constraint, when systems are only susceptible to modification at the margin. This is a sure sign that today's systems have exhausted their technical potential, that they cannot outstrip their original design limitations. Hence the growing frustration among librarians about the products on offer, and where they are forced to make buying decisions, a heightened awareness that they are purchasing obsolescent systems providing short-term solutions at best.

Library automation companies are therefore faced with the challenge of developing completely new systems, based on 1990s technology and with the potential to meet the new needs of libraries through the 1990s and beyond.

These will of course be systems based on a rigorous application of standards. They will be open systems in the proper sense of the phrase, that is to say they will follow the general computer industry trend away from proprietary solutions and they will be built using compatible, interchangeable, industry-standard, commodity products for all the fundamental building blocks of the system - hardware, operating system, database management system, communications products, user interface, and so forth.

It is important to recognise that most systems today are still being sold on the basis of very spurious claims about openness. What has happened is this. Three or four years ago most suppliers found themselves locked into one or at best a limited range of outdated minicomputers

which no longer provided the power which libraries needed at a price they could afford. Suppliers desperately needed modern, state-of-the-art hardware platforms. So they grafted their existing systems onto UNIX by means of a kind of interface. This gave them much more freedom of choice so far as hardware was concerned.

CLSI was the first company to do this, and they were followed by all the PICK-based suppliers - Dynix, McDonnell Douglas, Bookshelf and GEAC (with their Advance system). But nothing fundamentally changed. Better hardware was on offer, but the same old tired systems were running on that hardware. Suppliers, of course, claimed that the whole universe had changed.

The new generation of systems is, however, on its way. BLCMP, having made the transition from the first to the second generation, now appears to have accomplished the difficult task of successfully developing and starting to install a third generation system. CLSI has done the same, although the future of the product is now unclear following the acquisition of the company by GEAC. Oracle is selling a system which also has convincing claims to belong to the new generation, while Dynix is another company to have developed a completely new system, although it is not yet available in this country.

The essential point is that all suppliers are faced with the need to make the transition to a new generation of systems. Even those who seem to have leapt the technological barrier are still faced with a huge task of developing functionality which is genuinely innovative.

This will be extremely difficult to achieve, and it will also be very expensive. It is precisely at a time like this, at a time of real generational change, that the possibility of structural change in the industry emerges. Some suppliers will undoubtedly be left behind and will disappear. Some completely new suppliers, unhampered by past history, will enter the market. The development of Oracle's interest in library automation is the best example of this. It is reasonable to suspect that only a few of the existing suppliers will make the transition.

But this generational change is not the only pressure forcing a transformation of the industry. One of the most crucial problems facing the industry arises from the rapidly declining value of hardware and the general pressure on hardware margins. Most traditional turnkey suppliers, such as CLSI, GEAC and Dynix, made their money from selling hardware. In any system sale, software was typically a rather small element. Now, however, that ready source of large revenues is drying up. A system which might have been sold for £500,000 a few years ago is likely to be sold for closer to £200,000 today.

This is putting immense pressure on suppliers either to increase sales volume, which is difficult to do in a finite market, or to maximise other revenue sources, such as software, maintenance and services. Whether the trick can be achieved by the dozen or so suppliers in the market must remain very doubtful.

This downward pressure on hardware revenues is accentuated by the development of open system solutions, and the associated trend towards the separation of software and hardware purchases. This trend is still very feeble in the library market, but it must be assumed that it will increase in strength, particularly in organisations where the automation of the library is regarded as part of an overall IT strategy, or where a computer services department exercises a

strong influence over the purchasing process. Suppliers face the real possibility of not being able to sell hardware at all.

Open systems, and the more general standardisation of hardware, also threaten maintenance revenues, on which so many suppliers rely for their existence. Maintenance prices have been forced down as dramatically as hardware prices. Furthermore, the more standard the systems become, the more the business of maintaining them can be opened up to competition. Again this trend is still not strong, but is clearly gathering force, particularly where peripheral equipment and telecommunications equipment is concerned.

The library automation industry is therefore faced with making the expensive transition to a new generation of systems at a time when its very economic basis appears increasingly insecure. Furthermore, this is happening in a period of economic recession from which the public sector on which the industry depends will be the last to emerge.

For these reasons, a period of turbulence and restructuring can be predicted. The recent purchase of CLSI by GEAC is a clear example that this is starting to happen. This purchase is instructive, not because it represents the emergence of some new, forward-thinking strategy on the part of GEAC - essentially it is a defensive move - but because of what it says about the weakness of a traditional turnkey supplier such as CLSI.

What might the industry look like in the future? It is certainly arguable that there will be a role for new types of companies. Oracle is a good example of a company which may be successful selling software only, probably in combination with other Oracle products, and since it is a very large company selling into a vast number of markets, it does not suffer in the same way as a specialist library automation supplier from the natural limit to the size of this particular vertical market.

Other software-only vendors may enter the market, and it is possible, in a genuinely standard, open environment, to envisage different software suppliers providing mini-modules of specialised functionality not provided by the principal system supplier. Z39.50 may prove to be a key piece of technology in this respect. However, this is probably rather unlikely to extend to the major core modules in view of their high level of integration.

However, it is likely to be some considerable time before the market is transformed totally by a full separation of hardware and software sales, and there are countervailing trends which suggest that there will be a market at the other end of the spectrum for totally comprehensive solutions. The move in IT provision towards facilities management and outsourcing generally in both the private and public sectors provides an example of this. Public library authorities, if not universities, may choose simply to hand over computer system provision to a third party.

Out of the present situation, therefore, two distinct trends can be identified, leading in opposite directions: one towards end-user independence, and the integration by the end-user of products and services supplied by a multiplicity of vendors; the other towards an even more thorough-going end-user dependence on a single supplier. The idea that open systems inevitably lead only in the first direction is surely mistaken.

It should be stressed that the model of end-user dependence on a single supplier for a comprehensive package of services does not necessarily imply that the products and the services will necessarily all come from that single supplier. That is one possibility, but another is for the supplier to act as the integrator of products and services from a variety of sources, only some of which are the supplier's own.

Over the next few years, therefore, we can in fact see four possible models of library automation provision.

- (1) Continuation of the present pattern with modifications - here libraries continue to use turnkey suppliers in the traditional way, with some tendency to use third parties for maintenance and to purchase elements of hardware separately.
- (2) End-user as integrator - here libraries move away from the traditional turnkey model and purchase products and services separately, integrating them through their own efforts.
- (3) Supplier as integrator - here libraries depend entirely on a single supplier to provide a comprehensive package of multiple-sourced products and services, all integrated in technical and managerial terms by the supplier. Aspects of this model can be found in the present situation where a supplier sub-contracts hardware maintenance, but for the future we are talking about a far wider range of bought-in services, extending to elements of software.
- (4) Supplier as single-source provider - here libraries depend on a single supplier to provide all the products and services necessary, but in a way which may go beyond the traditional turnkey model, with the services extending to contracted responsibility for system implementation, management and service provision.

Change in the library automation industry will not be sudden. In terms of both systems and structure, there will be overlap and interconnections between the two generations. But the broad direction of change is clear, and there is little doubt that it will occur.

The industry's vision of the future

A new generation of systems is gradually emerging, but what will these provide in terms of new functionality? First, it is important to guard against excessive expectations of the first releases of these new systems. Suppliers are struggling to make the basic transition to 1990s technology, and the difficulties of this should not be underestimated. In the interests of continuity, suppliers are obliged to reproduce first of all the functionality of their existing systems, and it will inevitably be some time before radically new functionality appears.

However, it is possible to describe a broad consensus among suppliers regarding the future functional shape of their systems. It must be stressed that this is what suppliers would like to happen. This is not to say that their vision will come into being, or that it fits with what university libraries actually want, but this vision will certainly have some influence on what happens.

First, there is a desire to make dramatic improvements in the user interface. This is the easiest advance to make once suppliers start developing in a modern environment. The current generation of systems, rooted in the 1970s and 1980s, offer user interfaces which are rudimentary compared with those available in the microcomputer world. There is potential for major advances in this area over the next few years, as greater use is made of windows, icons, colour and graphics.

Second, suppliers see their systems as providing access to a much wider range of information, held in both conventional and multimedia formats. Some suppliers are more advanced than others in making it possible to load externally-derived databases onto local systems, but all stress the role of the library system as a gateway to a wider world of information. In both the public and academic library sectors, this view of the library as a generic information provider is a powerful source of inspiration to system designers.

Third, there is a common assumption among system suppliers that library computer systems need to become genuine library management systems. The current generation of systems has virtually nothing to do with library management. Systems today produce various kinds of statistical reports, but they cannot claim to be more than the passive source of a restricted range of raw data.

Suppliers are now starting to see library automation systems being developed into genuine resource management tools. Systems could be used to monitor all the resources of the library, not just the bookstock but also the staff resources, the space, the equipment and the financial resources. In general, automation could be applied to the total resources of the library in such a way as to ensure that the objectives of the library are met in an efficient and effective way. Predictive modelling, genuine statistical analysis and perhaps an element of heuristics may all take their place in this.

Fourth, most suppliers are endeavouring to provide their systems with a more pronounced end-user focus. In the past library automation was mainly staff-focused, but this began to change with the introduction of OPACs. Features such as self-reservation, self-renewal, direct access to personal information and self-issue will become commonplace if suppliers are to be believed. In so far as charges for individual services are introduced, borrower accounting systems will also be on the development agenda.

Finally, emerging systems ought to be increasingly capable of implementing standards. While there is no complete agreement on which are the key enabling standards to support, all suppliers regard the implementation of standards as central to their development strategies.

So this is how suppliers view the future. The vision which suppliers project is defined by the well-informed library, delivering a huge range of information in text, image and sound; the well-managed library, where the automated system functions as a genuine resource management tool; the communicating library, functioning both as a genuine gateway to a global information network and as a host on that network; the efficient library, providing a wide range of staff-saving, self-service facilities and using standards to automate still further mechanical processes such as book acquisition, and the well-presented library, boasting systems with sparkling user interfaces.

How deliverable is the vision

It is arguable that the frustration felt by librarians at the unresponsiveness of suppliers in recent years need only be a temporary phenomenon. Now that the generational change is finally being made, the industry can be expected to move forward rapidly to develop the kind of systems which everybody wants.

There is a degree of truth in this proposition, and the ability of some suppliers to take major steps forward may be encouraged by the squeezing out from the market of weaker suppliers, leaving those remaining in a stronger position to invest confidently in continuing R&D. It can be argued, therefore, that the products on offer will now evolve quite naturally without the consumer needing to find new ways of exerting pressure for change.

There are three areas at least in which progress can be expected with confidence.

First, we can expect significant improvements in existing application modules, leading to enhanced functionality, greater ease of use and better integration. It ought finally to be possible to obtain systems which perform all the basic internal processes fully, effectively and reliably.

Second, there should be a major transformation of the user interface. As stated earlier, improved user interfaces are easy to implement once suppliers begin to develop within a modern software environment, although suppliers are still not clear whether a particular standard, such as X/WINDOWS, will drive development in this area. Nevertheless, it is clear from the initial versions of the new generation systems that vast improvements in the user interface have already occurred, and librarians can look forward to presenting a convincing image of modernity to their users in the future.

Third, we can be confident about the emergence of a variety of self-service options. All suppliers are working on these, or have already made some, admittedly rudimentary, facilities available. Problems remain, especially in terms of compatibility with existing library security systems, but both the security system suppliers, such as 3M, and the library system vendors see this as a key area of development, and there is no reason to think that it will not come to fruition in the near future. Certainly there is growing demand from libraries for facilities of this kind, and this will encourage the development process.

In these limited areas, therefore, we can expect the work of libraries to be eased by the new generation of systems. The development of self-service facilities should be particularly helpful in coping with increased student numbers. Although it is unlikely to lead to reductions in overall staffing levels, since it seems that self-service may well stimulate usage, and this in itself may well generate other kinds of work for staff, nevertheless self-service facilities ought to mean that larger numbers of students can be given a better service than they receive at present, with less congestion and shorter queues.

But once we look beyond these immediate and apparently unproblematic areas of improvement, problems start to emerge. Not only do there appear to be serious difficulties with some aspects

of the suppliers' vision of the future, but there also seem to be issues which are not being addressed at all.

Let us take first the vision of the library system as the library's information gateway. Suppliers have long been concerned to project this vision in order to keep the library system at the heart of the action. It is, however, both unnecessary and probably unrealistic. It is unnecessary because it is much more logical to regard the desktop PC or workstation as the gateway, with the library system as one among many sources of information to which the gateway gives access, while it is unrealistic because the library system gateway would very likely become overloaded. Why channel everything through the library system when the traffic can be handled more efficiently in other ways?

Now this starts to raise complex and difficult questions which have not been properly considered, and which extend to other areas of functionality. It also seems that suppliers are as much in the dark as librarians.

Thinking about the overall topology of the campus information network, what is the proper level at which particular applications should be provided? Take the concept of a CWIS. Does this software reside on a client PC on the user's desk, or on the library system, or on another campus server? And is the data in the same place? Should traditional application modules, such as cataloguing, circulation, acquisitions and OPAC, be redeveloped as client applications, offered using X/WINDOWS on individual workstations as one supplier advocates, or will these be developed on small UNIX machines supporting clusters of terminals? While the client/server architecture appears to be widely favoured among the developers of new generation systems, there is no unanimity on this point, nor on the question of what functions, in a client/server architecture, as the client.

The same issues can be seen in relation to the use of the library system as a genuine resource management tool. Again, at what level in the overall topology of the campus information system should this kind of application be provided? Are we thinking about software provided by the supplier, or facilities incorporated in a standard RDBMS, or some other third party application? This leads to another key issue. What is the relationship of the library system to other MIS on campus? On the face of it, these could be usefully brought together, but there is little evidence either that librarians know precisely what is needed - if anything - or that suppliers have begun to think about meeting the need, if it exists. What we confront here is the important fact of ignorance on both sides.

In these two areas of functionality, therefore, information and management, we can already see three problems about the deliverability of the plausible vision of the future described by suppliers.

First, the vision may be inappropriate, as in the case of the tendency to locate the traditional library system at the heart of information provision.

Second, the vision fails to confront key issues of the most appropriate forms of system architectures and network topologies.

Third, there is ignorance of what is needed on both sides.

Similar problems emerge if we look at the question of standards. What is important here are not so much generic standards such as UNIX or TCP/IP, although these are by no means unproblematic, but the key enabling standards, such as Z39.50 and EDIFACT, which affect real applications in a more direct way.

When it comes to these standards, we appear to confront another situation of the blind leading the blind: on the one hand, abstract statements of need and on the other vacuous commitments to compliance. When it comes to thinking through how a standard such as Z39.50 will actually be used, what its real potential is, there is largely silence so far as the library automation industry and its clients are concerned.

Inevitably, therefore, we also confront the same lack of clarity when it comes to thinking about how Z39.50 will fit into the overall campus information environment: the same questions arise relating to appropriate architectures and network topologies.

This is not to say that the supporters of Z39.50 have no sense of how it can be used. The excellent paper on standards produced for the Libraries Review by Lorcan Dempsey, Anne Mumford and Bill Tuck includes a clear statement of the potential of Z39.50 (this paper is included in this volume). It is the integration of the standard into real systems and networks, and the determination of the place of the traditional library system in the resultant framework of communication, which remains difficult to envision with consistency and a real sense of practicality.

The difficulty is highlighted in the Dempsey, Mumford, Tuck paper itself, where a picture is presented of the virtual library. Here the library user connects to the 'Information Server', but the authors are obliged to qualify this by stating that they "use the phrase for convenience to cover the organised presentation of services, and do not suggest how it is constructed." This is no criticism of the authors, whose paper has other purposes, but it neatly highlights the problem, of which they themselves are well aware. What libraries, library system suppliers and others need to start addressing is the precise form of construction of this Information Server.

Similar problems would be encountered if we examined any of the other key enabling standards, such as EDIFACT or the ILL protocol. But in addition to these difficulties with standards, we also find that important potential application areas are hardly being considered at all.

For example, no suppliers seem to be talking about the ways in which library systems might relate to the use of technology in teaching and learning. We encounter here a tremendous gulf between the central concerns of those involved in higher education and the suppliers' perception of those concerns.

To take a second example, there also seem to be no discussions going on about the ways in which library systems might relate to the improvement of the cross-campus information flows which underpin the purchase of materials, either by the library or by the bookshop. Reading lists are central to this, and in some universities efforts are being made to automate these, but there is undoubtedly scope for doing much more in this respect. This is further discussed later in this paper.

Both of these examples point in the same direction. Librarians complain bitterly about the systems on offer, but it is arguable that very few of us have a fully worked-out, coherent vision of what we really want to achieve through library automation. Suppliers on the other hand, typically working on a rather small scale and without the resources to behave differently, remain largely ignorant of many of the important areas which need to be addressed, and are certainly ill-informed when it comes to a detailed understanding of the forces which are transforming higher education. The idea that suppliers really do know what is needed, but for one reason or another (sloth, inadequate resources, American bias ...) refuse to produce the goods, is based on a deep misunderstanding of the real character of the library automation industry.

Ways forward

In the preceding section it has been argued that the developments now taking place in the library automation industry will themselves produce clear improvements in the products on offer, at least in the areas of existing functionality, user interface and self-service facilities. No special action is required on the part of the user community to enable this to happen.

This is in itself a decisive argument against advocates of a MAC-style initiative in the field of library automation. Apart from the very considerable reservations which most observers would have about the feasibility and cost of such an initiative, it is unnecessary. The library automation industry is emerging from an exceptionally difficult period, one which it has shared with much of the rest of the computer industry, and the strong companies within the industry now look well capable of producing systems which meet the essential needs of the 1990s. It would be absurd to invest public money in an alternative, especially at a time when the cost of systems is declining all the time.

This analysis also undermines the validity of a related approach, which seeks to develop some kind of ideal specification. This approach is rooted in the frustration of the past few years, but again, so far as essential functionality is concerned, is no longer necessary. In any event, it betrays a deep misunderstanding of the way in which the industry would respond to such a universal specification, and an ignorance of the way in which system sales are made.

While the improvements about which we can feel confident will ease the work of the library, and enable it to present a much more modern image, they will not impact significantly on the fundamental problems which libraries face. If library automation systems are going to have a more decisive impact, they will need to transcend their basic functional offerings.

However, beyond what has been described as essential functionality for the 1990s, it is clear from the previous section that it is far from certain whether or not library automation systems do in fact have a more extended role to play in making an impact on the fundamental problems which libraries are now facing. As we have seen, the vision of suppliers is at least flawed, and may well be entirely inappropriate, while on the other hand there are areas which are not being discussed at all where there is potential for the application of IT and where the traditional library system might be incorporated.

There are three observations which can be made about this situation, two of which have been made already but which can usefully be brought together here.

First, it seems reasonably clear that the implementation of basic application-level standards, such as Z39.50, would enhance the value of library automation systems, if not in the more extended ways envisaged by suppliers, then at least in more limited ways.

Support for Z39.50 will enable the library system to be more effectively networked, and this is clearly a desirable objective, even if there are serious reservations, as explained earlier, about the utility of the library system as a gateway. Support for EDI and ILL standards will clearly enable suppliers to bring about improvements in these two areas which should lead to efficiency gains.

The implementation of these standards from a technical point of view is clearly the business of suppliers, but having said this, we still confront the difficulty over the way in which the library system should be incorporated into the overall topology of the campus information system, and in the case of EDI and ILL we lack a precise understanding of what their application might mean.

The second observation relates to the questions explored earlier to do with the more extended supplier vision of the future library automation system, particularly in relation to the system as information provider and the system as resource management tool. As we have seen, precisely the same questions arise here about the correct level at which the applications should reside and the most appropriate system architectures to use. The impression is that the suppliers' extended version of the future of the library system is inappropriate, and that the needs of the library will be addressed outwith the traditional automation system, which will find its place as just another server on the network. However, this argument needs to be tested further.

The third observation simply repeats the point made earlier, that there appear to be cross-campus applications, in which the library system might be involved, which have considerable potential, but which are untested and about which there appears to be little discussion.

Recommendations

Four main recommendations commend themselves at the end of this analysis.

First, the library automation industry is undergoing a generational change which is almost at an end, and libraries can look forward to the emergence of reliable, well-presented, low-cost systems capable of providing essential functionality for the 1990s. It is not clear if these systems have a wider role to play, but in view of the way in which the library automation industry is developing, there is no justification for investing in either MAC-type initiatives or in projects designed to produce ideal specifications.

Second, there is a need to encourage the implementation of application-level standards to improve, in the limited, non-idealist sense outlined above, the efficiency and networkability of the new generation of systems. Work should be done to identify the key enabling standards, and to provide the university library community as a whole with a shared understanding of the

practical value of these standards. If it can be correctly focused, the proposed JUGL/UKOLN conference on standards for libraries might be a suitable starting point for this initiative. The work being done among Scottish university libraries to produce a shared understanding of needs might also be valuable in this context.

Third, in order to extend the common understanding of the future role of library systems, work should be done on the broader questions raised at a number of points in this paper on the future shape of campus information environments, examining the most appropriate level at which different applications should reside, and the form of integration of the library system into wider networks.

Fourth, work should also be done to explore at least one area of cross-campus automation. The most promising application appears to be connected with the production of reading lists and other acquisition-related information, and this theme is taken up in a separate paper to the IT Sub-Committee.

Integrated book supply systems on the university campus

Richard Heseltine
The University of Hull

Introduction

This short document provides a preliminary analysis of the various flows of information which, on the typical university campus, lead to book-purchasing decisions by the two principal providers of books for students, the library and the bookshop. The paper looks at the inadequacies of the unsystematic procedures which govern these decisions at present, and puts forward proposals for a new system of integrated book purchasing.

The author was assisted in the development of the ideas presented here by Rene Olivieri of Blackwells Publishing. The views expressed in the document are, however, those of the author alone.

The chaotic campus

This paper is concerned with the supply of conventional printed materials, and in effect with books rather than with any other documentary forms. It is assumed that for the foreseeable future, printed books will remain an important information resource for most students, and that their learning will be affected to a significant extent by the ease with which they are able to obtain them.

Students get their books from two principal sources, the library and the local bookshop. In this paper it is assumed, for the sake of simplicity, that we are dealing with a self-contained campus with its own bookshop. Clearly there are many universities in which this is not exactly the case, but the general description of the purchasing procedures given here does arguably apply, with qualifications, in most situations.

At present there appears to be almost complete lack of overall management of the process of placing books in the hands of students. Despite the best efforts of booksellers and publishers, the process seems to be quite chaotic, with no effective central focus at all.

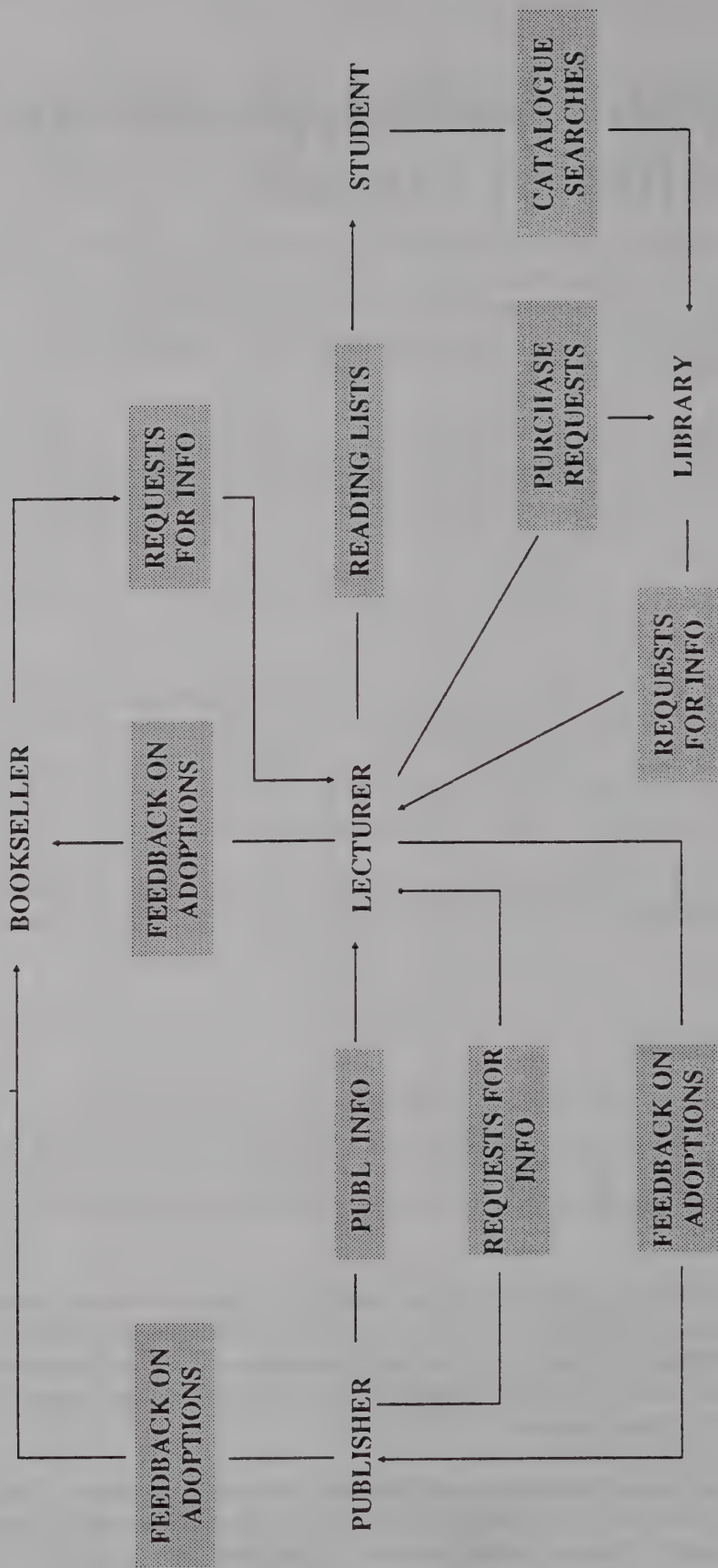


Figure 1: unintegrated information flows

The information flows which are involved are represented diagrammatically in *Figure 1*. All of the information flows centre on the individual lecturer, who, it must be stressed, is not regarded here as the villain of the piece but rather as the victim of an uncontrolled and disorganised set of practices. What we confront is a situation in which publisher, bookshop and library flutter like moths around a thousand points of light, the individual members of academic staff, and do so, like moths, with a sense of desperate purpose but without perhaps achieving very much. The academic points of light, meanwhile, remain fixed and passive partners in these frantic autumnal gyrations.

The first flow of information gives the lecturer details of books which might be used in teaching. Ultimately all of this information originates with the publisher, but there are diverse methods of transmitting it: publishers' catalogues; inspection copies; sales calls; reviews; word of mouth; browsing in bookshops, and, in some universities, recommendation by library staff. It should be noticed that the lecturer does not typically make use of electronic sources of information on published or about-to-be-published books, such as Bookbank or the Book Data files.

In one way or another, lecturers then decide to adopt specific titles for use in their teaching. It is at this point that the fun begins. How can the interested parties - the publisher, the bookshop and the library - find out about these adoption decisions and take the appropriate action?

Publishers attempt to glean this information from lecturers in order to pass it on to booksellers, or to urge the lecturers themselves to inform the booksellers. Libraries meanwhile depend on purchase requests being passed through to them in good time, and with a correct assessment of the number of copies to be bought, although rarely does a reading list find its way to the library, and in many cases no action is even taken by the lecturer to recommend the purchase to the library. In a recent survey at the University of Hull, it was found that in 26% of cases where users failed to find the book required, the book in question was not even owned by the Library, despite appearing on a reading list.

Interestingly enough, bookshops appear to have the most highly-developed procedures for obtaining information from lecturers about adoptions. For some reason, lecturers seem more willing to pass information about recommended titles and expected demand for those titles to the campus bookshop than to the library.

The role of the lecturer in this process is unpredictable. There is a wide variety of practice. Some lecturers review their reading lists every year, some almost never. Some indicate which books they recommend for purchase, some do not. Some attempt to prioritise reading lists, while others regard them as a bibliography of the subject, unrelated to availability. Some work closely with the library to ensure that provision is adequate, others behave as if the library scarcely exists. In fact departmental secretaries are often regarded as the best source of reading lists. Lecturers make intellectual decisions about which books they consider valuable in teaching, but are subject to no consistent procedures to ensure that those decisions are translated into books on shelves, whether in the library or in the bookshop.

Systematic failure

The chaotic state of affairs described in the previous section is not the result of personal failings. In particular, it is not because lecturers are lazy, arrogant or other-worldly, although some of them may be all these things. The problem is the complete lack of a systematic, managed approach to which all parties can contribute.

What we confront here is a series of unintegrated flows of essentially the same bibliographic information. The situation is reminiscent of unautomated libraries, where the same bibliographic information used to be created over and over again for different purposes. Except that in the unautomated library, there was at least some overall control which ensured that the different processes occurred in a timely and effective way.

In this case, the same bibliographic data is being separately produced and distributed on as many as six occasions: publisher to lecturer; lecturer to bookshop; publisher to bookshop; lecturer to library; lecturer to student; library to student. Furthermore, the lack of overall management means that a number of the information flows are very weak, notably those between lecturer and library and lecturer and bookshop; that there is no collaboration between some of those involved, notably between library and bookshop; and that there is no guarantee of actions being taken in time. Above all, the lecturer at the centre of the activity, around whom all others revolve, is paradoxically the only player whose primary interests do not depend on the success of the process, and who, moreover, is entirely unaccountable for it.

Integrated book supply systems

Attempts have been made in the past to improve the production and distribution of reading lists. This does not, however, reach to the heart of the problem. The way to remove the inefficiencies in the present system, and ultimately to provide a better service to students, is surely to integrate the separate flows of bibliographic data and reduce the dependence of the system on the goodwill and diligence of thousands of individual lecturers.

One way of achieving this is illustrated in *Figure 2*. At the heart of the proposed system is a single database to which all parties have access. This might well be a logical subset of the library's own database, but for the moment we can envisage it as a separate database mounted on the campus network.

The focus of the database would be taught course provision, and its coverage would be limited to the kind of material which would be found on a typical reading list. It might in fact be limited to essential reading, some of which consisted of books recommended for purchase.

Lecturers would continue to obtain information about publications through the variety of channels mentioned earlier, but would input their adoption decisions once only to the shared database. The decision would need to be accompanied by an indication of the priority assigned to the book. The database would include information about all modules taught, the lecturers responsible for teaching them, the number of students expected to take them, and it would be possible to view all books adopted for a particular module, or to identify all the modules for which one particular title had been adopted.

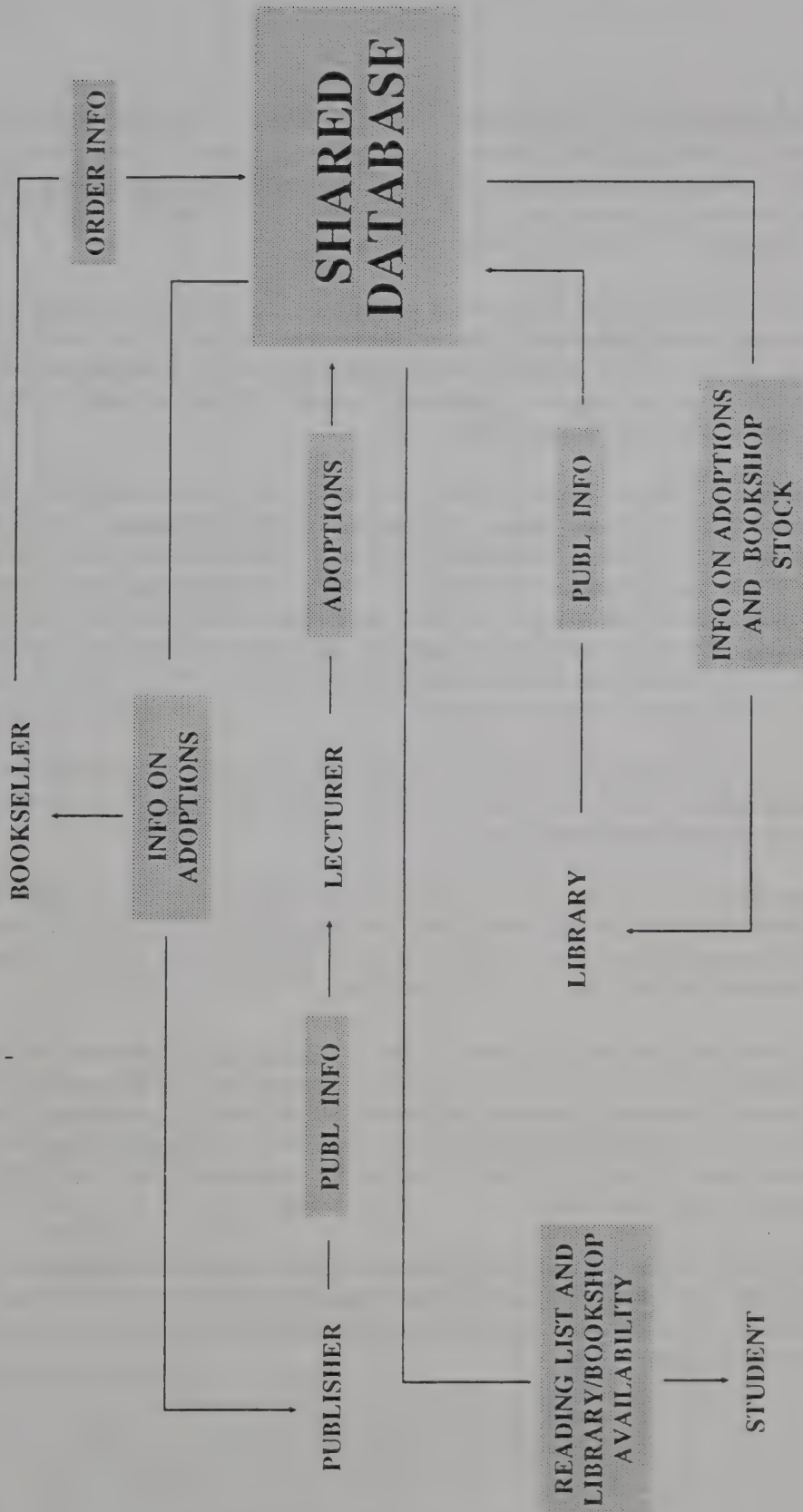


Figure 2: integrated purchasing system

So far this proposal is not too dissimilar from the attempts made in some library automation systems to provide separate information about in-demand books (the 'reserve book room' module of some American systems) except that it incorporates the suggestion of direct lecturer input. In order to go beyond this, it would necessary to use the database as the principal source of information for all parties concerned.

For the publisher and bookseller it would be possible to go straight to the shared database (presuming there are not issues of commercial confidentiality here) to see what new titles had been adopted and with what priority, and they could then use the system to make supply decisions, as well as to gain useful marketing information. These two agencies would presumably help to pay for the system.

Ideally it would then be possible to link the proposed system with the bookshop's stock control system to enable the shared database to include information about copies in stock. This would allow the student to search the database and discover (i) recommended reading for a particular module, which could optionally be printed; (ii) number of copies in the library, and their availability, and (iii) number of copies in the bookshop and their price. The system would only be useful to students in so far as it was complete, and included retrospectively everything on reading lists. However, the system could still be used for new publications by the other parties involved without this retrospective element.

For the lecturer, there would no longer be any need to communicate separately with four different agencies (publisher, bookshop, library, student), resulting in a considerable saving of time and measurable efficiency gains.

For the library, there would be a ready means of obtaining up-to-date information on recommended reading, and the library could then take much more timely decisions about the quantities to order. In addition, the library might be able to take into account information about the bookshop's holdings and its ordering decisions.

The system might be further improved if it were used as a source of potential requirements information. Using sources such as Book Data, the lecturer could obtain regularly updated information about new or upcoming publications, output according to a tailored interest profile, and would avoid the need to input bibliographic data at all in these cases. This would have the added advantage of ensuring the use of more reliable bibliographic data than might otherwise be input by lecturers themselves.

Clearly this is only a very preliminary proposal, and the details are less important than the principle involved, which is to automate and integrate the separate and often rather weak information flows which exist at present. It offers the opportunity to manage learning instead of just trying to support it.

The potential for electronic journals in UK academia

Pam Waddell

Science and Engineering Policy Studies Unit

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Summary

1 The Higher Education Funding Council of England (HEFCE) is conducting a Libraries Review to look at library and information provision for the diverse and expanding university sector. As part of the consideration of the impact of new technologies on information provision, the Science and Engineering Policy Studies Unit (SEPSU) was commissioned to conduct a study on electronic journals.

2 An overview of potential developments in electronic journals, based on discussions with selected individuals, was presented in an interim report in October 1992, and forms the background to this report. In the second phase we focused on the views and experiences of three groups: active users of electronic journals (questionnaire survey of 27 authors on two American online-only journals), Learned/Professional Society publishers (interviews with six of a range of size and discipline) and Research Councils (opinions sought from two).

3 A journal is defined in this report as a series of refereed articles; an electronic journal is one for which the full end product is available online, on CD-ROM or in any electronic form.

4 Three basic models exist for the supply of learned journals to the academic community: a) the current model, in which publishers manage the refereeing and production of papers, written by academics, into a journal and sell it individuals or single libraries, in a choice of forms; b) user cooperatives, in which the publisher still produces journals but sells them to cooperatives of universities for distribution to individual libraries; c) user supply, in which the reduced tasks of publishing in the electronic medium are handled entirely by academics themselves, or Learned Societies on their behalf.

5 There are two basic models of payment for access to electronic journals: a) by subscription, to individual users or through site licenses, with cost depending on number of users or b) by use, either number of times or length of time a paper was accessed. Site licenses might encourage wider, and per use payment more focused reading patterns to develop.

6 The sample of academics, though selected for being active users of electronic journals, read and contributed to electronic journals infrequently compared to printed journals, although the number of electronic journals is very small. Little short term growth in use was expected, but predictions for the longer term varied from no change to electronic journals taking over.

7 The strictness of refereeing was comparable on electronic journals to print on paper, though it tended to be faster and less formal. The quality of papers was as good as expected in relatively new journals.

8 The sample journals were welcomed as being interactive, informal and fast and were well suited to provocative articles, although important specialist articles were reserved for better established print on paper journals where they would gain more visibility and credit.

9 Often authors had not known about electronic journals before they were invited to contribute, but had found it a positive experience.

10 Learned/Professional Society publishers were generally cautious in their attitude to electronic journals, only two electronic journals being under development, although all were aware of the need to keep abreast of the field and the potential benefits to users.

11 Some Society publishers increasingly accept papers electronically and format and standardize them in-house, saving money as well as theoretically giving them choices and control over their own material. However, this movement is partly driven by the demands of electronic document delivery services and cooperatives wishing to share holdings, and individual Learned Societies have little control over the acceptable formats and costing structures. Cooperation between Societies to standardize delivery mechanisms and formats could improve efficiency, make electronic journals more widely accessible and open up radically different possibilities for dissemination of papers.

12 Learned Societies are concerned about the loss of subscriptions, and therefore income, that electronic document delivery, shared holdings and electronic journals may bring. Electronic journals could not increase sales in a closed market, rather ease of copying and sharing would decrease subscriptions.

13 The Societies tended to be rooted in traditional journal models and pricing structures, although site licenses might overcome concerns about loss of revenue through sharing. A realistically priced per use model might appear expensive and librarians would not like the inability to plan budgets.

14 Development costs were not necessarily a disincentive to launching electronic journals, although there was concern about ongoing additional costs of producing journals in print and electronically in parallel initially.

15 Publishing electronic journals on traditional lines would change the balance of costs and lead to a net saving, mostly on printing and dispatch costs, but the saving would vary widely between journals. There would also be a saving in the lapsed time taken for the production stage, though not the editorial phase. The net acceleration would be unlikely to have a major impact on research practices, if considered in the context of other informal, but faster, modes of communication.

16 Learned Society publishers were against a centrally led initiative in electronic publishing that would be distanced from the user communities, but they would be willing to

cooperate with related Societies in sharing the risk of experimentation, and developing standards and pricing mechanisms.

17 One Research Councils interviewed was actively promoting electronic communication in the context of seeking more cost effective research communication, whilst the other was generally content to leave the organization of communication to other sectors.

18 Any Research or Funding Council aid in developing electronic communication should be pump-priming rather than subsidy; the ongoing cost of information for research is already catered for in research grants.

19 The status of electronic journals could not be determined by the Councils, this was a matter for the academic community, though status depends on journals being accessed, one Council would be willing to assist with promoting wider access to electronic journals.

20 Many librarians are enthusiastic users of electronic information sources and see electronic journals as having potential for saving money and space. They see their future role in information retrieval rather than archiving.

21 Technological advances are being made in the academic and commercial sectors that are overcoming some of the problems with electronic journals, such as with graphics and compatibility.

22 A coordinated research initiative to explore novel models for electronic journals, led by academics with support and coordination by one or more funding bodies, could focus attention on the academic, rather than simply the economic, consequences of electronic journals.

23 Cooperation between Learned Society Publishers could enable the efficient standardization of formats and payment models and ensure that developments in electronic publishing were not solely driven by externally imposed commercial pressure.

24 Promotion of the advantages of electronic journals, including training in their full applications, will encourage use which will in turn raise status. Visible support from Funding and Research Councils could also raise status.

Acknowledgements

I would like to thank all those who cooperated in this study, particularly to those who were interviewed, for their time and open discussion of the issues. In addition to formal participants, I am grateful to those in the electronic publishing community who offered encouragement and insight.

Thanks are extended to my SEPSU colleagues for their help, especially to Patsy Isle and Anna Zouga who provided research support.

Introduction

Context of the study

With the recent removal of the binary divide and growth in student numbers the Higher Education Funding Councils in England, Wales and Scotland have the task of distributing resources to a large number of expanding universities of diverse size and mission. Yet the available resources are not expanding in parallel, so there is increasing emphasis on cost effectiveness of resource provision.

The Libraries Review

Amongst the resources that the Funding Councils provide for are library and information services, vital both for the teaching and research functions of the Universities. Funding for these has been under particular pressure owing to the growth in the number of research journals and rapid increases in subscription charges. Thus, in order to decide how best to supply these needs in the future for the diverse and expanding university sector, the Higher Education Funding Councils have established a Libraries Review, chaired by Brian Follett. A major aspect of the discussions is the potential impact of new technologies on the effectiveness and cost of library services, and how that impact may be optimized. This aspect is being considered by the Information Technology Sub-Committee of the Review, chaired by Lynne Brindley.

Electronic Communication

One area of technological advance that could have a major impact on the cost and effectiveness of information supply is electronic communication. Informal electronic communication is already widespread amongst researchers in UK academia, through e-mail, electronic bulletin boards and electronic 'clubs', particularly in certain rapidly developing disciplines such as artificial intelligence. Electronic networks are in place and potentially widely accessible: all UK university campuses are connected through JANET (Joint Academic Network) and a recent survey by Shackel showed that about 90% of academics have their own microcomputer. With SuperJANET expected to be fully operational by the end of the 1990s, further expansion of informal electronic communication in academia can be expected.

At a more 'formal' level, electronic information has already had a major impact on library services through the growth in the use of electronic databases for searching. For example, the Science Citation Index is now available electronically through the Bath University Information and Data Service (BIDS), and is widely used by students and staff in universities.

Electronic journals

One means of communication that has not become widely used or accepted so far, however, is the electronic journal. Yet electronic journals have the potential dramatically to alter the economics of learned journals, save storage space, improve access to published information for teaching and research and change the whole structure of journals. Since it seems that electronic

journals could contribute to the more cost effective provision of information services being sought in the Library Review, the HEFCE have commissioned SEPSU to conduct a study of the potential impact of electronic journals on UK academia, and the factors that have inhibited their growth to date.

Objectives of the study

The SEPSU study aims to consider electronic journals from economic, academic and technical perspectives. It looks at the potential advantages and disadvantages that they might bring to the whole academic community. The study also explores the barriers that have prevented more extensive introduction of electronic journals and how their introduction could be facilitated in a way that would optimize their impact on UK academia, particularly by the HEFCE.

Interim report

An interim report was produced by SEPSU in October 1992, that aimed to consider electronic journals very broadly, based on discussions with a selection of key individuals. It explored some of the possible scenarios for electronic journal introduction and the implications for funding and for access to researchers and students. The interim report was designed to give the Library Review members an overview which allowed them, in consultation with SEPSU, to decide on the issues to be explored in greater depth in the second part of the study. This approach was adopted to ensure that the study would be of maximum value to the HEFCE in their discussions of their policy on the introduction of electronic journals.

Second phase

On the basis of the interim report and the existing expertise in the IT Sub-Committee of the Review, and in order not to duplicate the efforts of other ongoing studies, it was decided that the second phase should focus on the issues relating to particular sectors of the academic community, as follows:

- (a) Authors of papers in electronic journals, that is academics with first-hand experience of the medium, were asked about their attitudes to and experiences of publishing in this medium in comparison to conventional print on paper journals.
- (b) Learned/Professional Society publishers, as potential producers of electronic journals, were asked about their activities and thoughts regarding electronic journals.
- (c) Research Councils, as current and future funders of information provision, were asked about their attitudes to electronically disseminated papers.

This final report integrates the more specific results of phase two with the broader perspective of the first phase, and is additionally informed by the literature, involvement in an Electronic Journal Exchange of Experience Meeting (organized by the British Library) and informal

conversations with a variety of players in the field. Thus, the results are discussed in a broad context and the report aims to draw out possible implications of potential developments in the field of electronic journals. This leads to the development of a number of policy options that might optimize the impacts of the introduction of electronic journals into UK academia.

Methodology

Background interviews

The interim report, which forms the broad basis of the final report, was based on discussions with a number of individuals and on background reading. The individuals we spoke to were selected so that each of the constituencies that are affected by electronic journals had some representation in this preliminary phase. The constituencies were:

- the academics who are the authors and end users of journals;
- the producers of journals - the commercial publishers and learned societies;
- the librarians who are the interface between the producers and users;
- the funders who pay for information provision;
- the technology drivers who develop and experiment with the means of production.

The people we spoke to were generally key players in the field of electronic information, and most of them belonged to more than one of the above constituencies. The interviews were deliberately unstructured to allow wide ranging discussion, and the content depended on the interests and experience of the individual. The interviews allowed us to identify a number of alternative courses for the development of electronic journals and their implications. The views of different people have been integrated and no opinion is attributed. The individuals interviewed in this phase were:

Terry Cannon & Neil Smith, British Library R&D Division.

Mel Collier, Director of Information Services, De Montfort University, setting up an electronic library with IBM backing.

Bernard Donovan, Secretary of Association of Learned and Professional Society Publishers (ALPSP), retired academic and former learned society journal editor.

Peter Swinnerton-Dyer, Chairman of Library and Information Sciences Council (LISC), former Chief Executive of UFC.

Sheila Edwards, Royal Society Librarian, Secretary of Science, Technology and Medicine Information Systems Study

Roger Elliott, Chief Executive, Oxford University Press

Brian Follett, Chairman of HEFCE Library Review

Peter Kirstein, Professor of Computer Science, UCL, Project Director of QUARTET and CORE

Jack Meadows, Dean of Education and Humanities, Loughborough University, involved in HUSAT and Institute of Physics/SCONUL electronic journal

John Slater, Professor of Computer Science, Kent University, involved with setting up BIDS

Peter Stone, Former librarian of Sussex University, leading figure in JANET based information services

As a consequence of the interim report, it was decided that three of the five sectors named above should be focused on in the second phase. The bulk of this report concerns these sectors, but the other two are discussed briefly at the end, for completeness.

Authors on electronic journals

Sample journals

Two refereed, learned, electronic journals were selected from which to draw the sample of authors. Initially we sought one American and one UK journal, with one being available in print on paper as well as electronically. However, the choice of established journals was very limited, so we included the following two on-line journals, neither of which is available in print:

Psychology is sponsored by the American Psychological Association and edited by Stevan Harnad, who also edits the highly regarded and long-established *Brain and Behavioural Sciences*. It specializes in short papers on which the author wants rapid feedback; both 'target' articles and commentary papers are refereed by members of the 60-strong Editorial Board. In this respect it differs from a conventional print on paper journal, but it adheres to tradition in that it appears in regular issues.

Postmodern Culture is produced by two academics. It publishes refereed interdisciplinary essays and reviews as well as other items such as original poetry and video scripts. The journal encourages discussion of new forms of academic communication, so the electronic medium is a frequent subject of this electronic journal. It mirrors a traditional journal in that it is issued three times a year.

Sample authors

The editors of these two electronic journals were contacted, by e-mail, and asked to provide information on their journals and also the names and addresses of 20-30 recent authors of articles. All the North American (the majority) and European authors were included in the survey. Questionnaires were sent to 23 authors on *Postmodern Culture*, by post, and to 24 authors on *Psychology*, by e-mail. Reminders were sent to non-respondents after a few weeks. A total of 27 responses were received (57%), although 17 came from *Psychology* contributors and only 10 from contributors to *Postmodern Culture*. The questionnaire

A questionnaire was designed that was short and simple to complete, yet ensured that the key questions were addressed. The full questionnaire can be seen in Annex A. It covered the four broad areas of:

- Current and future reading and contributing practice.
- Quality of electronic journals compared to print on paper.
- Advantages and disadvantages of different media.
- Barriers to publishing in electronic journals and how they were overcome.

A few questions were quantitative, but the majority required written answers, so most of the analysis was performed by reading and collating views and experiences rather than being computerized. Most of the results from questionnaire survey are given in Chapter IV, *Authors as users of electronic journals*, but the more general comments of authors contribute to the broad background of opinions that inform the whole report.

Learned Society Publishers

Sample of organizations and interviewees

Representatives from six Learned/Professional Society publishers were selected from whom to seek information on current and future journal publishing practices. The bodies were chosen to cover a wide range of sizes, with journal publishing operations ranging from having no permanent staff to more than one hundred, and from four to 35 refereed journals. They were also selected to cover a broad range of academic disciplines, some serving, in addition, a community beyond the academic one.

Within each organization we sought to interview one or two individuals who would give us a strategic view of their journal publication, particularly with respect to new media, whilst being able to access more detailed information on the economics and management of journal production. The selected organizations and the individuals whom we interviewed were as follows:

- British Medical Association: Richard Smith, Head of Publication; Maurice Long, Production Manager.
- British Psychological Society: Michelle Benjamin, Publications Manager.
- Institute of Physics Publishing: David Pullinger, Electronic Product Manager.
- Institute of Electrical Engineers Publishing: Rod Montrose, Managing Director.
- Modern Humanities Research Association: David Wells, Honorary Secretary.
- The Royal Society: Peter Cooper, Assistant Secretary, National Affairs (responsible for Publications); Chris Purdon, Publications Production Manager.

Interviews and data

The interviews were open and broad ranging, allowing the particular experiences and priorities of the interviewee to be explored, although the discussions were based on three main themes:

- Current activities relating to electronic dissemination.
- Perceived opportunities and threats of the new medium.
- Changes in production speed and costs expected from electronic publishing.

In addition, we requested quantitative information on the timescales, costs and staffing of the different stages of current journal production. Five of six organizations provided at least some of the requested data, in a variety of forms.

Research Councils

In this relatively small part of the study we approached two Research Councils, the MRC and ESRC, to discuss with them what role they might play in driving a move towards electronic journals or how they might react to their introduction. The MRC response came in writing, from M.B. Kemp, Research Policy Development Manager, whilst interviews were held at the ESRC with Adrian Alsop, Secretary to Research Resources Board and Nicky Ferguson, Networked Information Officer.

In the case of both Research Councils the following three points were addressed:

- Who pays for electronically distributed information
- Who owns electronic information
- To what extent are electronic papers being given equal credence as print on paper publications and to what extent should they be.

Only two Councils having been approached, it is difficult to avoid attribution of opinions discussed in chapter VI. However, notes from the ESRC interviews were approved by those involved and the MRC response was in writing, so we have not attempted to avoid attributing views in this case.

Possible models of electronic journals

This chapter is intended to put the rest of the results in perspective by providing a set of definitions and models which form the foundation for the subsequent discussions. They are based largely on information gained in the first phase of the study, through interviews with key players in the field of electronic publishing and from the literature, and are further informed by the more general comments of those surveyed in the second phase. As such, the models are not original, unique or comprehensive, but represent an objective synthesis of the predominant current views on electronic journals. The definitions were also developed to keep the study with the remit required by the HEFCE.

What is an electronic journal?

Definition and function of journals

The term journal, as applied in this report, refers to any collection of learned articles that have been accepted via the peer review process for publication as part of a series. The learned journal has three principal functions; first, to inform students and researchers of new research results and scholarship. Thus, along with informal communication, seminars and conferences, journals stimulate further research. In this case the more rapid publication is, the greater might be its impact. Second, as a result of Funding Council and others' policies, papers in learned journals, although not in themselves the reason for conducting research, are often used as a proxy measure of output when assessing researchers for funding or career development. Thus publishing in a prestige journal is important to academics, but so is number of publications, which is at least partly responsible for proliferation in the number of papers and journals

published. The third function of learned journals is as a refereed archive of past research, to be consulted in the future, to a greater or lesser extent depending on the subject.

It is acknowledged that informal or unrefereed oral and written communication makes up a large and important part of academic information exchange, but this is only discussed where developments in this so-called 'grey literature' may influence the future of learned journals.

The electronically delivered journal

In this report a journal is only described as electronic if the full end product is available electronically, regardless of production methods (see below). In fact, there are, so far, very few refereed electronic journals, and most of those are experimental, although electronic databases and electronic delivery of single documents are becoming more common. Electronic journals, as well as the wide range of other electronic information, may be delivered via a number of routes in various formats. One means of delivery is on-line via networks such as the academic network, JANET, or one of the public networks. Alternatively information can be delivered on CD-ROM, or even on diskettes. However, this report concentrates on on-line journals, as these offer the greatest possibilities for departure from the traditional print on paper journal model.

There are also differing forms of information. If the primary source is electronic, as well as being delivered in an electronic format, this is the 'pure' or prospective electronic journal. If the primary source is printed, it can be scanned and transmitted electronically; this is the retrospective electronic journal. Either the prospective or retrospective electronic journal may be delivered via networks or CD-ROM.

Standardization

A perceived problem with electronic journals is that a wide range of hardware platforms, operating systems and reading software mean that texts prepared on one computer cannot usually be transmitted in their original form to another. Rather, documents tend to have been transmitted in ASCII format, which loses the structure of text and is useless for all but the simplest graphics. However, standards delivery mechanisms and software that allows delivery and receipt in the original format are both emerging, even without any intervention. Whilst a broad choice of host and format may be desirable to give flexibility, encouragement could speed up the setting of standards and development of document communication software. This would improve efficiency and speed up the process of making journals more universally accessible.

Form of the electronic journal

It is widely believed that if electronic journals are to be successful, they have to add something that print on paper journals cannot do, and the form of electronic journals has the potential to be very different to that of a conventional journal. There is no technical need for an electronic journal to have issues, but rather each paper can be added as soon as it has been accepted. More fundamental than this, however, are the possibilities for indexing and cross referencing.

An electronic journal could be thought of as a database, and if all or groups of journals were provided through compatible hosts in compatible formats the result could be an enormous and powerful information source. Since there is evidence that users primarily 'browse' by looking at abstracts, titles and some key figures, these could be the first point of entry and could be read from the screen. If the full text and figures were desired, that could be called up for printing, since reading long texts on screen is uncomfortable.

Comprehensive cross-referencing and the fact that the space constraints need not be the same with electronic journals could radically alter the size and shape of journals. An outcome of the so-called information explosion has been that researchers have had to focus more narrowly in their interests, so many specialist journals have emerged. But if specialized papers are easy to find in a general journal, specialized journals in their current form could become obsolete, although to some extent this depends on the organization of subscriptions. It might be necessary to retain elements of the specialist journal, such as individual specialist editorial boards, to maintain refereeing standards. However, the difference would be that all readers could access all subject areas, which could promote broader, interdisciplinary research activity.

Details of the forms of journals that could develop in the electronic medium need to be experimented with to establish what best suits the end user, but it seems that so far electronic journals have been rather conservatively based on the conventional journal and not exploring the full potential of the medium.

Producing journals electronically

Although an electronic journal is defined in this study as one delivered in an electronic format, it is important to note that electronic communication plays a large part in the production of conventional print on paper journals. In the production of all journals a growing proportion of papers are delivered on disc or through the academic network (JANET), and at least some of the refereeing process may use electronic mail. The extent to which electronic communication is used varies widely between subjects and between publishers. Standard electronic text formats and mark-up languages are emerging, but their promotion could increase the efficiency of the overall field of journal production. In many cases the whole of the final version exists in electronic form.

Individual papers may be provided to readers in electronic form, largely as a result of the Adonis Project, in which a number of publishers agreed to make their journals available electronically, although the journal is only sold as a print on paper product. Even if the journal is not currently distributed electronically, saving the articles in an appropriate electronic form, with as much of the formatting information intact as possible, may be important. If publishers are encouraged to do this, such a source of back issues in readable electronic form could be an important resource for the future.

Models of organization

Three models are presented here for convenience, but in reality they form a spectrum of possibilities.

Current model

The principle of the current model of print on paper journal supply is universal, even if the details vary. The researcher, usually an academic, passes their intellectual property, in the form of a paper, to the 'publisher', either a commercial publisher or a Learned Society. The 'publisher' then oversees the refereeing and production of the paper as part of a journal and then sells the end product back to the academic and other research communities, usually through libraries. One model for producing electronic journals would be to retain this system of direct supply. The publishers could offer journals on a range of media, including retaining the possibility of providing a print on paper version. The choice of journals would continue to be in the hands of individuals, librarians and their library committees in this case. Individual institutions could also negotiate prices for limited or campus-wide access, depending on the payment model adopted (see below).

User cooperatives

In this model the publisher is still the supplier of electronic journals, but they are selling their product to several cooperatives or even a single body representing all universities. This could operate along the line of the Combined Higher Education Software Team (CHEST), based at Bath University: they pay software companies a price equivalent to several copies of a programme, and can then distribute the programme to as many universities as they wish. The universities collectively save money and the software companies have no marketing costs in this sector. Similarly, access to electronic journals could be bought from publishers for all universities at a 'reduced' rate, using either or both of the payment models discussed below. The universities, or their representative, would have the power to drive the price down, through representing a large buyer. The drawback of such a system is that individual universities might have a reduction in the choice of journals to which they can subscribe, as there is likely to be pressure to take only those bought through the cooperative. This could reduce access to journals for researchers and students in certain subject areas. There need not be a single cooperative, however, so universities could join one or more that best met their requirements within the limits of their budgets. This could also set up constructive competition which could ensure standards were maintained.

User supply

As pointed out above, the producers of the primary papers are also largely the end users. With print on paper journals, between writing and publication the 'publisher' manages the editorial and refereeing process, turns the collected papers into hard copy, and markets and distributes the final product. In some cases the 'publisher' role is taken by a Learned Society, and so is also part of the academic community, or the role is shared between a Learned Society and an Academic Publisher. In other cases a Commercial Publisher is responsible for all the stages.

With electronic only journals parts of the production phase could theoretically disappear, assuming papers are submitted electronically, and the distribution phase is greatly simplified.

If, in addition, electronic journals were to be distributed through a central agent, as discussed in the previous section, there would seem to be a greatly reduced role for the 'publisher'. One postulated model for the organization of electronic journals is that the reduced 'publishing' role could be handled entirely within academia, by academics themselves or, to a greater extent than currently, through the Learned Societies, for example. However, this ignores the important role of the publishers in putting up the money for new developments and carrying the risks. Neither the Learned Societies or the academic community could make large scale investments without financial backup. Excluding the commercial publishers might be expected to save the academic community money in the long run. Whilst they may not be 'profiteering', commercial publishers are by necessity profit making organizations. Although Learned Society publishers do often make profits too, these are fed back into other activities for their community but this often extends beyond academia.

This sort of radical reform of publishing would require considerable investment and careful management in the early stages. Academics would have to be strongly convinced of the value of electronic journals run by Learned Societies to take the risk of transferring their authorship, readership and editorial work to a new set of journals.

One problem with this model is that it would have to reverse a trend, driven by academics themselves, to remove the administrative burdens of publishing from them to the publishing houses. With the increasing pressure on academics' time and the proliferation of journals, the academics have tended to reduce their role to that of peer reviewers and overseers of quality, rather than managing all aspects of the journals as they once did.

Models of payment

Regardless of whether journals are supplied to users directly from commercial publishers, through a universities cooperative or supplied by the Learned Societies, there are two basic models of payment.

Journal subscriptions

Access to all papers in a given electronic journal would be equivalent to the way in which most print on paper journals are currently bought. Individuals could subscribe or, perhaps at a higher price, a site licence could be bought for a whole campus, by the library. This is the same principle as individuals and libraries paying different subscription rates for print on paper journals. The site licence would be a practical way to overcome some of the potential problem of easy copying, although it might be essential to retain the choice of individual subscriptions for access to journals not subscribed to by the library. The site licence for an on-line system could be limited to a certain number of users, such that if the system was overloaded the excess at any site were automatically thrown off the system. This way heavy users would have to subscribe to more than one licence, so payment would reflect use to some extent. Alternatively, subscriptions could be scaled according to the number of users at the site.

If a model was adopted whereby journals were distributed via cooperatives (see above) there could be a choice of payment models. Either the individual universities could then take out

subscriptions with the cooperatives, although presumably at a cheaper rate than would be available direct from a commercial publisher. Alternatively, to minimise bureaucratic costs, all universities could be allowed 'free' access to all journals that the cooperatives subscribed to, all subscription costs being incurred centrally in this case.

By use payment

The technology of electronic journals raises the possibility of a completely different model of payment. It is possible to record who uses which papers, so that payment could be by use, based on either number of times accessed or length of time accessed, on an individual paper basis. This approach could be employed whichever supply model was adopted. The charges would be difficult to set initially, although statistics on usage patterns of pilot electronic journals could help.

One potential implication of this model, particularly if publishers were direct suppliers, is that papers in large fields might be favoured for publication at the expense of the smaller speciality publications. This might lead to a loss of outlet for research results in certain specialist fields, and a lack of access to those results for others. As refereed publications are considered an important indicator of research output researchers might ultimately be forced to convince funders that their papers will be sufficiently widely read to be considered published.

Per use charges could either be paid by a central body, the library on behalf of the researchers and students or by the library for students but directly by researchers. The latter option would require funds to be made available to individual researchers to spend as they chose on information, possibly through research grants. Any model of per use payment would make the individual researcher more accountable for their consumption of information resources.

Implications for use

The subscription and the per use models would have very different effects on the patterns of use of electronic journals. If site licenses allowed 'free' access from the point of view of the researchers and students, it might be expected that papers would be more widely read than if a per use charge was applied. If researchers were accountable for their use of journals, they might become much more focused in their use of information, searching for specific topics rather than browsing, and reducing the chance of serendipitous findings. This would not necessarily save money for the universities overall though, since the cost of producing journals would remain the same, so fewer users would mean higher prices per use.

Authors as users of electronic journals

The academic users of learned journals have a great deal of influence over the direction that electronic journals take, because if they have a poor opinion of them they will not contribute papers to them or read the end product. Since academics also set courses, they also have influence over whether undergraduates use journals extensively or not. This implies that it is

most important to understand what users attitudes and experiences are, and how individuals can be convinced of the value of electronic journals, if it is considered that this development would be desirable for UK academia.

Characteristics of sample of users

In this study we have examined the attitudes and experiences of individuals who had been authors of papers in electronic journals. This was in order to provide us with information from academics with first-hand experience of electronic journals, but also to complement existing or ongoing studies of broader user and potential user groups. The 27 authors who responded to the questionnaire were all academics, mostly at universities in the USA, although a few were based in the UK. They were at a wide range of academic grades, from graduate students to professors, and therefore a range of ages too.

Patterns of journal use

Recent use of journals

Even the academics in this survey, selected as users of electronic journals, used them very little in comparison to print on paper journals, but very few electronic journals exist so far. The average number of printed papers published by the respondents in each of the last five years was 2.6 per year, ranging from none to ten by any individual in any one year, with no particular trend with time. In contrast, they had only produced an average of 1.5 electronic papers in total in the five years, ranging from one to three per individual. However, the number of electronic journals did increase with time; only two of the authors had published any prior to 1991, whereas all but four had published at least one electronic paper in 1992. A similar pattern was seen in the number of journal titles regularly used. Respondents regularly contributed to an average of five print on paper journals but only one online journal, and read an average of 13.5 print on paper but only 1.6 online titles.

Expected future use

Respondents tended towards predicting little short term change in the balance between print and electronic journal use, some pointing out that as the latter had only appeared in the last few years it would take time for them to develop, if they did at all. The most frequently cited reason for expected lack of short term growth was the poor quality of graphics currently available on electronic journals. It might be expected that this would be an even greater inhibiting factor to the growth of scientific electronic journals, as these rely more heavily on illustrations. As to the longer term impact of electronic journals, authors were fairly evenly split between those who saw them as remaining marginal, those who predicted that they would grow in importance, particularly as a discussion medium, but always coexisting with print journals, and those who thought that they would eventually take over as the predominant type of refereed journals. Amongst the reasons given for electronic journals not taking over from print on paper were inadequate cataloguing by librarians, which means that they are not widely known about. However, this is a problem that can be overcome. Other reasons, discussed below, were that

the perceived status of electronic journals made it harder to attract quality papers, and the inertia or vested interests of the journal producers.

Quality of electronic journals

Strictness and process of refereeing

A frequently voiced concern about electronic journals is that they are not strictly refereed and so cannot be of high quality. This may arise from the association in people's minds between electronic journals and informal electronic communication media, such as bulletin boards. In fact, the prevalent view amongst our sample of authors was that the refereeing was as strict for electronic journals, although a few said it was better and a few said worse. It seems that the process of refereeing was rather less formal in the case of the sample journals, than is the case for traditional print journals, with more scope for interaction between authors and referees. This was welcomed as it increased the value of the peer review process of papers, as was the greater speed of refereeing (see below) experienced compared to print journals.

Quality of papers

The general view of respondents was that the standard of writing in the electronic journals that they had experienced was of good quality. Papers were not necessarily of equivalent quality to the very best print on paper journals, but then most electronic journals are new and have yet to develop a sufficiently good reputation and wide audience to attract top papers. One author pointed out that *Psychology* managed to attract quality papers, however, because its editor was also known as the editor of an established and prestigious print on paper journal. It was widely commented that the quality of the graphics was poor on electronic journals, which limited the type of paper that could be disseminated through this medium.

Advantages of electronic and print journals

Interactiveness and informality

In general the electronic journals that the sample had experienced were welcomed as having a less formal and more exploratory style than print on paper journals. They were considered exploratory both in the nature of their papers, publishing more provocative or speculative articles, and the format of presentation. In particular, the format is designed to allow greater interaction between contributors; one of the journals, *Psychology*, publishes longer, primary articles along with shorter, invited papers discussing them. Many of the authors had found this a stimulating and valuable format and one to which electronic journals are well suited owing to the ease and speed of electronic communication. This approach was also seen to encourage interdisciplinary discussion, and some authors had specifically chosen one of the electronic journals in order to reach beyond their usual specialist audience. Some pointed out, however, that to date much of the interdisciplinary exchange had concerned the medium itself.

Prestige

In general, the authors in the survey said that they reserved their most weighty and important specialist articles for print on paper journals. They were seen to carry more authority and therefore to be given more credit in the peer review and career advancement process. This is because print on paper journals generally have a more established reputation, in part related to their better established, more specialist readership. If a researcher is to be credited for an article, it needs to be easily accessible to his/her peers. All electronic journals are relatively new, and any new printed journal would face some of the same problems in gaining respectability and therefore attracting top papers. However, electronic journals seem to have the additional disadvantage that they are somehow generally perceived to be less respectable, perhaps because of their association with unrefereed, informal means of communication, such as bulletin boards.

Speed of publication

Papers in electronic journals were published very much more quickly than those in print on paper journals in the experience of respondents. This was particularly appreciated where a rapid outlet and feedback was sought for a novel or speculative idea. In this respect, electronic papers have the potential to have a much more immediate and direct impact on ongoing research than print on paper journals. The greater speed of publication was said to result from faster refereeing of papers as well as faster production. The authors in the survey were asked to estimate the normal time taken for a paper to be accepted after submission, and the time for it to be published after acceptance. The refereeing stage was estimated to take on average of 23 weeks for print journals and only five weeks for online journals, and the production stage was estimated to take 39 weeks and seven weeks for the two media respectively. Thus the whole process takes only a fraction of the time in the case of electronic journals. However, it was pointed out that papers in electronic journal tend to be shorter, their interactive nature depends on a short turnover time, and they are not yet dealing with anything like at the number of papers that an established print journal handles. The implication of this is that if the volume of papers increased, or the journal concentrated on weightier papers, some of this speed advantage would disappear.

Permanence

A number of respondents perceived that print on paper journals were more permanent and that they were important as an archive of past work. There is no reason in theory why an electronic journal should not be properly archived but it does imply that the technology for reading older electronic forms would have to be retained in the future. Having a permanent record of scholarship was an important aspect of publishing for the respondents.

Overcoming barriers to use

Many of the authors in the sample had no particular reservations about publishing in the electronic medium, there had simply not been an appropriate electronic journal for their

subject, or they had not known about it previously. Several welcomed the arrival of electronic journals or had been eager to experiment with the new medium. In many of these cases it was the invitation of the editor or the suggestion of a colleague that had persuaded them to try publishing in an electronic journal. Perhaps for many academics barriers to publishing electronically do not really exist, they only need to be informed about the existence of electronic journals in their field or to be persuaded of their value.

In those cases where researchers had had reservations about publishing in the medium, most of them related to the points raised in the previous section. Some said that their concerns about the rigour of the refereeing process and the visibility of the journal had proved unfounded. However, concerns remained about the prestige attached to electronic journals by the wider academic community and those that conduct peer review, and this acts as a real disincentive to publishing in the medium on more than an occasional basis.

Learned/professional society publishers

Learned and Professional Societies are major producers of academic journals so they could potentially play a very significant role in the introduction of electronic journals. Learned and Professional Societies aim to serve their communities of academics (and in some cases others), so the primary objective of their publishing operations is to provide a service, not to make profit. Having said that, most aim to and succeed in profiting from publishing, in order to support their other activities.

Activities and attitudes relating to electronic journals

General attitudes

By and large the six Learned/Professional Societies that we spoke to were cautious in their approach to electronic journals, although all of them were conscious of the growth in electronic communication and the need to keep themselves aware of developments. Some had a member of staff or committee with responsibility for keeping abreast of the field. However, there were differences in the outlook of the six regarding the future of electronic journals and their role in it. Whilst some Learned Society publishers were content to wait and watch development for the time being, others were actively exploring and experimenting with the electronic medium. The level of activity depended partly on the size of the publishing outfit, but also on the community that the Society served. In some cases there was said to be no demand from the community or even a lack of access of many journal users to electronic networks. Some individuals predicted that electronic journals would inevitably take over from print on paper eventually, whereas others thought that their potential was being overstated and that the idea would 'blow over' and that they would remain a marginal addition to the print medium.

Electronic journals in progress

Only two of the Learned Societies had gone as far as targeting a journal for electronic dissemination. In one case it was a new journal and in the other an existing one; in both cases

the journal would be produced in print on paper in parallel. Neither electronic journal had been launched yet, even in its pilot phase, so the final form was not yet clear and neither were the distribution and subscription arrangements. Although not the focus of this study, it was interesting to note that the Societies tended to be better advanced in their thinking about or development of databases or bibliographies in electronic form. Some of the ways in which these have been handled may give indication for the future of electronic journals, as discussed below.

Factors driving development of electronic dissemination

Advantages to users

The main objective of the Learned/Professional Society publishers has to be to provide a service to their community, and electronic journals are seen to have the potential to improve that service. They can improve access, provide greatly improved indexing and searching facilities and provide new models for journals, such as the interactive discussion model reported in Chapter IV. It was pointed out that young people tend to be very computer literate now, and the familiarity of this generation with electronic information and the advantages it can bring will drive the process towards electronic journals. At the same time, computer technology is becoming increasingly affordable and, therefore, accessible to more and more people.

Production of papers in electronic form

A factor that will make the transition to electronic journals easier is that generally papers for conventional print on paper journals exist at some stage in their production in electronic form, and for several reasons some of the Learned/Professional Society publishers are moving towards possessing fully marked-up and standardized electronic versions of their papers prior to printing. One reason concerns efficiency and cost-cutting, increasingly important as journal subscriptions fall. Most papers are initially produced by the author electronically on a word processor, whether they are submitted on disc, across the networks, or in hard copy. Rather than having the paper re-keyed into a second electronic format for printing, several Learned Society Publishers are streamlining the system and removing a stage. They encourage authors to submit papers electronically in one of a few standard forms which can then be standardized in-house ready for printing. This requires more staff time from the publishers, as well as development costs, but saves money on having papers re-keyed by the printers or agencies. However, more importantly in the context of this report, they have their papers available in a standard electronic form, under their own control. This process may be easier for publishers that tend to produce text-heavy papers, but some science publishers with a need for graphics and formulae are also moving this way. Not all the Learned Society Publishers are following this approach, though, some have found it more trouble than it is worth for them.

Availability for document delivery

A further factor driving Learned Society publishers towards possessing standardized electronic versions is the growth of the current awareness/document delivery services. Individual

document delivery in paper form has existed for some time, but agencies are increasingly offering the option of electronic delivery, whether through national libraries, the ADONIS project or commercial companies specializing in these services. As document delivery services are often linked to powerful electronic databases and current awareness services, they are likely to become increasingly attractive to users, particularly when coupled with the reduced number of journals that academic libraries can now afford to subscribe to. Whilst Learned Societies were unhappy about the low royalties (if any) paid by these agencies, and the fact that payments trickled in, they generally felt that they had no alternative but to cooperate, otherwise their papers would not reach a wide audience. Cooperation would increasingly mean making papers available in fully formatted and standardized electronic form, in order to provide better quality than scanned images, for electronic delivery. Indeed a number of individuals thought that a whole new model of electronic publishing would arise from the current awareness/document delivery pattern and replace either print on paper journals or electronic versions of the traditional journal model.

Demand for shared holdings

A further pressure to provide electronic versions of papers comes from multi-campus universities, or groups of universities, particularly in the USA, who wish to share journal holdings and distribute them on their own networks. Like supply to the document delivery agencies, demand may be increasing for full electronic versions of journals. Again, Learned Society publishers may have little choice but to cooperate with these potentially powerful cooperatives, if their journals are to remain visible and if they are to fulfil their primary objective of disseminating widely to their community.

Impact of electronic journals on income

Essentially all of the concerns raised by the Learned Society publishers relating to the development of electronic journals came down to fears about loss of income. They all thought it was important to maintain revenue, either because they only broke even anyway or, more usually, because the Learned Society depended on income from publications to support their other activities.

Maintaining subscriptions

There was concern that document delivery services and shared holdings, as discussed above, would reduce the subscriptions to journals and thus income. However, subscriptions and income need not be synonymous if new payment models are developed for provision of individual articles or copies of journals that are made available through local networks. Some of the Societies felt forced into cooperating with these activities, however, without having the ability, on their own, to control what they charged for what they provided.

Several Learned Societies were also concerned about loss of subscriptions even if they produced electronic journals themselves. Most of them thought in terms of producing journals in print and electronically in parallel, at least until all the users had access to and wished to

receive the electronic version. Indeed, this was the approach being adopted in the case of the two journals that were being developed. It was predicted that this would not increase the market, which was thought to be closed. It was feared that the electronic versions would be very easy to copy or to share between libraries that would otherwise be individual subscribers, so there could be a net drop in the number of subscriptions. However it came about, there was concern that not only would reduced subscriptions lead to loss in revenue overall, but that it might lead to some smaller specialist journals becoming less viable, at cost to researchers in that field.

Lessons from electronic databases

Some of the Learned Society publishers had already started to publish electronic databases (in CD-ROM format), and voiced similar concern regarding loss of subscriptions to these. It was too early to see how overall subscriptions had changed or how the balance between subscriptions to the electronic and hard copy was developing. This might be a model for what might happen with journals in the future though. Some measures were being considered to safeguard subscriptions to the hard copy of a database, however, such as delaying the issue of the electronic version or charging more for it. It was argued that more could be charged for the electronic version as it had added value, and if there was demand for this the higher price would be accepted.

Payment models

As most of the publishers tended to be rooted in the traditional concept of a learned journal, not all had given thought to new models of paying for electronic papers. With respect to an electronic database, one of the publishers was beginning to explore the possibility of adjusting the price of subscriptions to the number of users. Again the impact of this new pricing structures could inform decisions regarding the pricing of electronic journals. It may certainly be a way to overcome fears of several subscriptions being replaced by one, with journals being shared between sites. A per use model of payment would have to be realistically priced, rather than the small royalties received for document delivery. However one or two people mentioned that they did not think a per use model of payment would be viable as individual papers were very infrequently referred to, so charges would appear very high and would put buyers off. This would be particularly detrimental in small and specialist fields where there may be few readers, but where the outlet for research and source of papers is nevertheless vital to them and their field. It was also thought that this model would be unpopular with librarians, as they would be unable to plan budgets.

Impact of electronic journals on costs

Additional production costs

Development costs did not necessarily inhibit the launch of electronic journals by the Learned Society publishers, although it was agreed that these would be substantial. Some Societies were willing to risk the initial outlay in order to explore the medium, and felt that they should

'trailblaze' for the benefit of the academic community. Others had development funds available but were not yet convinced that the benefits of electronic journals would merit the investment. It was more ongoing increases in costs that were of concern. As Society representatives tended to think that the way forward was to produce journals in print and electronically in parallel, some argued that this would incur greater expense as the electronic and print versions of the journal would each have their own costs. However, if, as discussed above, publishers are being encouraged to hold standardized electronic versions of all papers before they go to print in any case, these versions could become the electronic version of the journals without additional cost.

Changing balance of production costs

What certainty would occur with a move towards entirely electronic journals would be a shift in the balance between elements of publishing costs. The Learned Society publishers were asked for data on current costs of journal publication so that it could be considered where saving might be made. It was pointed out that this could be at best an approximate exercise and that extreme caution should be applied as changing one part of a complex equation always had implications for other parts. In addition, as will be seen, there is wide variation in the cost breakdown of various elements of journal publishing between publishers and between titles, making anything but broad generalizations impossible. As publishers tended to consider electronic journals as retaining a traditional model, we will consider the cost implications of this on the various stages.

Editorial and management costs

If the traditional journal model was retained, the editorial costs would be unchanged other than some small changes in postal charges if all communication was electronic; these currently constitute an average of about 20% of the costs of the journals on which we had data, although this ranged from less than 10% to almost half. Likewise, subscriber maintenance and management would not change, although this amounts to less than 5% of current costs on average. Should the development of electronic journals lead to very different payment models, however, this could change considerably, particularly if several possible subscription methods co-existed, depending on the journal and the users.

Changes in production costs

The production of learned journals, that is the processes following acceptance up to despatch of the journal, generally constitutes the largest proportion of costs; the average for the journals considered was 60%, ranging from less than half to more than 80%. The production process consists of typesetting, checking and proof reading, and printing and binding. The typesetting phase is one that many publishers are dispensing with as there are moves towards more and more papers being submitted electronically (see above). One of the drives for this is cost cutting, although whilst the payment of setting agencies is saved there is an increase in staff time, and therefore cost, in standardizing texts. As a result of a more streamlined process without a typesetting phase, savings might also be expected in the checking and proof reading phases. Any net saving resulting from papers being received electronically cannot really be said

to result from electronic journals, however, as these processes are also being changed for print journals.

A substantial proportion of production costs are accounted for by printing and paper costs (about a third according to one publisher, or about a quarter of total costs). If a journal was to be produced on-line only, these costs would effectively disappear, but if a journal was produced in CD-ROM form there would be the costs of producing those. However, at least for an interim period publishers envisage papers being produced in print on paper as well as electronically, so the saving would be much reduced.

Despatch of journals

Currently despatch constitutes an average of about 15% of journal publication costs (ranging from a few percent to a third of the costs of individual titles). This might be assumed to be an aspect of journal costs that would disappear for on-line, but not CD-ROM, journals, although this would depend on the way in which the use of networks was paid for in the future. Even if there is no cost to journal producers, resulting in a reduced cost of publications, the maintenance of the networks has to be paid for on behalf of all academic users somehow.

Impact on speed of publication

In the previous chapter it was seen that our sample of authors had found that papers in electronic journals were published much faster than those in print on paper journals. However, the sample journals consisted of short articles and the format diverged considerably from that of a traditional print on paper journal. In contrast, the Learned Society Publishers, who tended to think in terms of a traditional model with only the means of distribution changing, did not predict such a great saving in time. From the data that some of the publishers gave us on time courses of publication, it seems that it typically takes seven or eight months for a paper to appear in print after submission. The lapsed time can, however, range from about three months to more than a year, depending on the length and nature of papers and on editorial policy and whether papers are retained to be part of a thematic set, for example.

Timescales of stages of process

Generally, the editorial process, from submission to acceptance, takes three or four months, *i.e.* about half of total publication time. The Society publishers saw no prospect of this part of the process being significantly accelerated as it depends largely on the time it takes reviewers to comment on papers and authors to reply to comments. Electronic communication could perhaps speed things up somewhat, but the human factor seems to be the rate limiting step. Any savings in publication time were expected to be in the production process. Assuming that papers were arriving in electronic form and did not have to be typeset, this stage would be replaced by the process of standardizing formats (see above) which would presumably take less time. Author checking would not be speeded up, although proof reading may be. The printing stage of production would disappear, which currently accounts for about a third of the production time, and be replaced by the short process of disseminating on the networks.

Impact on research

In total, therefore, the production phase of publishing might be reduced to half the time, but as the editorial phase would not be speeded up the total saving in time for a paper to appear would be of the order of 25%. In the previous chapter it was seen that the speed of publication of the sample electronic journals was seen as an advantage in the impact that papers had on research. However, these journals went beyond simply being electronic versions of printed journals and the editorial process was also faster. If the traditional model of a journal is adhered to it seems that the 25% saving in time would not significantly change the impact that papers have on research.

Support for a cooperative initiative

Central initiative

In general the Learned Society publishers were against the concept of a central body overseeing, running or even paying up front for learned journal publishing. The Learned Societies thought that since they were controlled by the members of their communities, they were best suited to providing for their needs. There is a danger that a central body would tend to be driven by economic considerations, and small specialist communities would tend to loose out.

Cooperation between publishers

In contrast, there was considerable support for the idea of cooperation between the Learned Society publishers, particularly those with overlapping memberships. Indeed some predicted that the market would make it necessary for publishers to share resources, whether or not this involved electronic dissemination. With respect to the drive towards electronic dissemination, there was argument that it would be of mutual benefit to share risks in experimenting with the new medium. This might allow less conservative models to be explored, rather than remaining rooted in the more conventional approaches generally being considered at present. They could also cooperate on standardization of formats and pricing mechanisms, which would increase efficiency, be helpful for the academic community and give the Learned Society publishers a stronger basis for negotiating with the agencies providing document delivery services.

Research councils and other sectors

This chapter predominantly considers the views of the Research Councils, but also summarizes the findings in the interim report regarding the sectors not followed up in the second phase.

Research Councils

The growth in electronic journals could have major implications for those bodies that fund the universities. This is recognized by the HEFCE which commissioned this study. For the Research Councils there are implications particularly for the funding and cost effectiveness of information provision and for the type of publications that are considered as indicators of research output in peer review.

General attitudes to electronic journals

Both Research Councils that were approached saw part of their mission as ensuring that research was conducted in a cost effective manner, and that the results of it were disseminated. However, there was a very marked contrast between the two in their general attitudes regarding a move towards electronic journals. ESRC saw the exploration of electronic publishing as part of the broader search for more cost effective communication, in the context of growing pressure on resources. They have a member of staff specifically employed to explore and promote alternatives to paper communication. ESRC would also be interested in a cooperative venture in the area of electronic journals, particularly an experimental approach with provision of support for academic led projects. They favoured a 'grass roots' movement towards electronic journals, doubting whether any central body should drive the process, as none could effectively understand all the needs of all communities. However, national bodies could facilitate the process through funding and promotion. In contrast to the ESRC attitude, the MRC seemed satisfied with a system of communication organized by the private sector and the learned/professional societies. Occasional reappraisal of the system, to improve cost effectiveness in the light of restricted resources and a growth in the volume of published material, was thought reasonable though, with electronic journals only being one aspect.

Paying for electronic journals

At present there are few electronic journals, so the first question is whether Research Councils should provide funds to encourage their development. MRC thought that if an activity was worthy of stimulation, it would be better to do this with pump-priming funds than by permanent subsidy. The ESRC not only agreed with this in principle, they expressed willingness to fund such activity to stimulate new communication media, as discussed above.

A different issue is paying for networked information as an ongoing service. At present institutions buying journals can either charge users or top slice budgets to provide a service 'free' to individuals, and MRC saw no reason why electronic journals should remove this control from the institutions. Grants from Research Councils already include a sum for indirect costs, including the provision of information through institutional libraries, and direct costs can provide for more specialist information needs. Whilst there may be an argument for shifts between these two elements, MRC saw no argument for change in responsibility between the Funding Councils and the Research Councils. ESRC pointed out that the new funding arrangements for indirect costs would shortly be reviewed, and that the imminent Science and Technology White Paper might also have implications.

Ownership of electronic information

Intellectual property rights are a major issue and it is widely perceived that the questions of copyright and security are greater, or at least less well resolved, for electronic information than for the printed word. However, the Research Councils were not clear in what way this was an issue for them, at least at this stage. The MRC pointed out that intellectual property belongs to the institution conducting the research, but once the research is published the rights move to the publisher. It was not clear why electronic journals should differ in this respect.

Status of electronic journals in peer review

It is clear from chapter IV that the perceived lower status of electronic journals is a barrier to their greater use, as gaining credit is one of the main functions of publishing. Neither Research Council felt that it could have much influence over which journals were credited in the peer review process, this being for the researchers to decide for themselves. It was pointed out that individual electronic journals would have to establish themselves like any new journal. Since a journal would only gain status if it was read, an appropriate purchasing/access system would need to be in place, and perhaps this would mean journals being produced in print as well as electronically to start with. ESRC thought that any increase in costs that parallel production would cause would be compensated by increased income resulting from wider access. However, if there were large investments needed in the transition phase, the Research and Funding Councils could provide some assistance, if it was felt that researchers would ultimately benefit.

Other sectors

The preceding chapters of the report have concentrated on the sectors studied in some detail in the second phase of the study. Some points arose in the initial stage concerning other sectors that are worth mention here for the sake of completeness, particularly concerning two groups largely responsible for encouraging developments in electronic communication.

Librarians

Librarians are the interface between the producers of journals and the users. As such, their are important because under some supply models it is the librarians and their library committees which will continue to determine what journals are available for researchers. Under any model the library will remain the primary source of information for students. Currently many librarians are taking an interest in electronic journals, and are certainly comfortable with electronic information as at the use of databases for literature searching becomes increasingly easy and common. The degree to which librarians have taken on electronic information sources does vary widely, depending on resources, the needs of their user community and their individual attitude. With the expansion of universities, library space is coming under pressure at some institutions. Questions are beginning to be asked about the economics of building new libraries to house large collections of printed documents compared to equipping libraries with facilities for receiving electronic information in the future. By and large librarians do not feel threatened by developments in electronic information, but they do see their role changing from

a more archival function to one in which they provide assistance and training on information retrieval.

Technology drivers

Technical developments are being made in both hardware and software that will solve many of the problems perceived by users and publishers of electronic journals. The key technical barriers to development are currently related to standards and compatibility, graphics, archiving electronic material and transforming archived print on paper material into electronic form. Those driving the technology that allows and improves electronic journals are based in a variety of sectors. In the commercial sector, some publishers, hardware and software companies all are making developments in the field. If it is left to them, then solutions will be market driven, which may or may not be to the advantage of the academic community. However, large number of academics are also conducting technical research relevant to electronic journals, some in collaboration with or partly funded by the commercial sector. These projects are more likely to be aiming to satisfy the needs of students and researchers, so support for such activities may prove beneficial to the UK academic community.

Access for those outside UK academia

One of the proposed standard hosts for electronic journals is the academic network, JANET, but whichever host was used the question of wider access would have to be considered. At the moment access to JANET is limited to UK academic institutions, but connections are possible with networks in other developed countries. As the majority of users of UK journals are based outside the UK, and the majority of journals used by UK academics are produced in other countries, it is important that good connections are ensured. There is some concern that a move towards electronic journals would disadvantage those in less developed countries without the infrastructure to support them.

Currently access to JANET is limited for industrial researchers who in some cases are major customers of learned journals, and in some areas are an integral part of the research community, such as in pharmacology. If there is not to be a loss of income and a damaging effect on academic-industrial exchange of information, arrangements would have to be made to allow industrial access to JANET, at least for the purpose of receiving journals, or linkage with the public networks, and for payment for access.

Discussion and policy options

The need fully to explore academic benefits

For technical change to succeed it must yield sufficient benefit, either in time and money saving or in allowing new activities to develop, to overcome the risk and the cost that must be borne in the transition period. In the case of electronic journals whether savings in the cost of producing and distributing journals will be worth the risk, and whether reductions in publication time will significantly benefit research practice in the long run, are both equivocal, particularly if a

traditional journal model is adhered to. The evidence presented in this report suggests that these potential benefits may not be sufficient on their own to justify electronic journal development, so they should be considered together with the changes in academic practice that could result.

Learned Society publishers, as potential developers of electronic journals within the academic community, tend to focus on the economic consequences, as they are very conscious of their requirement to maintain their publications income in order to support other activities for their community. In contrast, users of existing electronic journals have found academic benefits from the medium in that it has enabled new models of journals to develop that offer something different from the traditional journal, such as interactive, discussion journals which are proving a stimulating addition to research communication. Furthermore, members of the academic community predict further benefits of the medium, such as powerful searching and cross-referencing facilities or the possibility of integrating text, moving images and sound, or wider and easier access to journals, all benefits that would have impact on the nature of academic communication and add value to it.

If too much emphasis is placed on the potential economic benefit, electronic journals may remain marginal without the full academic benefits having been explored. Alternatively, the developments may be driven by commercial interests, such as the document delivery companies. Whilst these companies must strive to produce a good service, as they depend on the custom of the academic community, their primary focus has to be economic rather than academic benefits. It is, therefore, suggested that a wider variety of electronic journal models should be encouraged in order to explore the range of potential benefits to the academic community.

Experimental initiative

A number of individual academic or commercial groups are exploring new journal models. Coordination of such activities and the encouragement of further experimentation could accelerate understanding of the benefits that electronic journals might bring, in terms of academic practice and economics. Such an initiative should be driven by the academic community as they have the best understanding of their needs and how their research and teaching practices might be affected by changes in communication provision. However, the initiative would also have to receive input from all the sectors concerned with using, publishing and paying for learned journals so that viable long term models develop.

As far as possible individual projects within the initiative should develop models that explore all aspects of electronic journal production. This may involve the collaboration of several groups with different expertise, along the lines of the current cooperation between the Institute of Physics Publishing and Loughborough University. Each new model should consider the style of journal and the access arrangements that will best suit the objectives of the particular journal and the community it is designed to reach. Developments are likely to be most interesting if encouragement is given to depart from the traditional journal model, whilst retaining important features such as rigorous quality control through peer review, and the ability to archive and retrieve papers. It is also important that any model should develop pricing structures that are workable, acceptable to the purchasers and result in the journal or group of journals being economically viable in the longer term without subsidy.

Such an initiative would require financial support and coordination. Coordination would foster an appropriate collaborative environment for the research by ensuring that research plans and results were discussed with other participants and by assisting in the search for appropriate partners. Coordination and funding by more than one body would serve to balance their different priorities. The HEFCE, ESRC and the British Library R&D Department might all be willing to cooperate in such a research initiative.

Cooperation of Learned Societies

Either as part of such a proposed initiative or separately, Learned Societies could benefit from coordinating their activities relating to electronic communication. As individuals they may be driven by commercial interests and more powerful cooperatives to hold their papers electronically in certain formats and to accept certain pricing structures. Collectively they may have the weight to insist on models that are more beneficial to their user communities, and they can have more control over the optimum dissemination of their material. Cooperation between Learned Societies could also lead to improved efficiency through the sharing of resources and experiences. A number of Societies are already considering strategic alliances, and Society Publishers communicate through ALPSP on the issue of new publishing media; these sorts of activities should be encouraged and developed.

Improving status of electronic journals

Electronic journals are widely perceived as having a lower status than print on paper journals, because of associations with unrefereed communication and the fact that most are new and unestablished. Since published, refereed papers are often used as a proxy measure for research output in the peer assessment process for winning funding or career progression, it is important to academics to publish in highly regarded and highly visible journals. In order for electronic journals to survive they need to start to attract readers, which will make them more visible, and top papers to improve their status.

A statement of support for electronic journals, or visible financial backing of an initiative promoting their development, by bodies such as the Research and Funding Councils, might in itself improve their status. In addition, as an experimental initiative begins to uncover new models of journals and their advantages to the users, these benefits should be promoted widely to the academic community. Promotion of electronic journals should include the provision of training in their full range of applications, to overcome technical inhibitions, and to ensure that all the benefits are exploited. Once electronic journals have attracted interest, particularly through the new possibilities in academic communication that they offer over print on paper journals, whilst maintaining rigorous peer review, they will become established and develop status.

Annexe A

SURVEY OF AUTHORS IN ELECTRONIC JOURNALS

SEPSU would be most grateful if you would complete this questionnaire as fully as possible and return it by fax to 44-71-930-2170 as soon as possible. None of your responses will be attributable, but please fill in your name so we can record who has replied. Please continue on a separate sheet if necessary.

BACKGROUND

- 1
- Name
-
- 2
- Position
-

PUBLISHING PRACTICE

- 3
- How many refereed papers have you published in each of the last five calendar years, and how many were published in each of the following forms?

	1992	1991	1990	1989	1988
Print on Paper
Online
Other (specify)

- 4
- How do you expect the balance between the media in which you publish to change in the short and longer term?
- 5
- How many different journal titles do you contribute to and read regularly?

	contribute	read
Print on paper
Online
Other (specify)

- 6
- How have these numbers of journal titles changed in the last five years and how do you expect them to change in the short and longer term?

ADVANTAGES AND DISADVANTAGES OF DIFFERENT MEDIA

- 7

In your experience, how do (i) the process and (ii) the strictness of the refereeing of online journals compare to print on paper journals?
- 8

In your experience, how do (i) the nature and (ii) the quality of papers in online journals compare to print on paper journals?
- 9

What is the average length of time (in weeks) you have had to wait for a paper in each type of journal to be taken through the following stages?

submission to acceptance

acceptance to publication

Print on paper
Online
Other (specify)
- 10

In the cases where you published papers electronically, why did you choose this medium? Are particular types of paper best suited to this medium?
- 11

In the cases where you published in print on paper journals, why did you choose this medium? Are particular types of paper best suited to this medium?
- 12

Before you had published in an electronic journal what factor(s) had inhibited you from doing so, and have these reservations turned out to be justified?
- 13

What factor(s) persuaded you to publish in the electronic medium, and overcome any reservations discussed above?

- 14 Please make any other comments you have about electronic journals, including any advantages and disadvantages of publishing in this medium that have not been discussed above.

Thank you for your cooperation in completing this questionnaire.

A note on SEPSU

The Science and Engineering Studies Policy Unit (SEPSU) aims to promote informed decision making on science and engineering policy within the UK and Europe and to provide analysis of high quality on strategic issues for science and engineering, to illuminate and encourage the policy debate. SEPSU has strong links throughout the science and engineering research and policy community and has access to the breadth and depth of experience and knowledge of the Fellows of its two parent bodies, the Royal Society and the Royal Academy of Engineering. Funding for the Unit is provided from the non-governmental resources of the Royal Society and the Royal Academy of Engineering and sale of services and publications.

SEPSU conducts studies into topical science and engineering policy issues, either of its own initiative, on behalf of its parent bodies, or in response to external commissions. Projects may involve collation and interpretation of existing sources of data or collection and analysis of original survey data by questionnaire and/or interview. SEPSU disseminates the results of most studies widely through publication. Major projects are published in the series of SEPSU Policy Studies or by the customer in the case of some contract work. In addition, SEPSU has published articles in science and science studies journals.

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Document technologies in higher education

David Hunter, Chris Lindesay, Nick Randall
Rank Xerox (UK) Limited

Executive summary

- The Higher Education library service in the UK is facing increasing demands on its resources at a time of serious financial and space constraints.
- Particular concerns are to contain the costs of acquiring publications and to achieve the most effective delivery of teaching and research materials to academics and students.
- Traditional publishing structures and technologies are not ideally suited to the needs of higher education and are adding to the pressures on libraries.
- New electronic demand publishing technologies are available which offer the possibility of radical changes in the way information is accessed and delivered, including the creation of digital libraries.
- Higher educational establishments in the UK have already invested heavily in demand print technologies on a purely commercial basis. The potential to apply these technologies to meet the needs of the library service is only now beginning to be investigated.
- There are technical, organisational and structural challenges to overcome before the full potential of these technologies can be realised.

Purpose of the paper

Rank Xerox (UK) Ltd. has been invited to submit a discussion paper on emerging electronic demand publishing technologies to the I.T. Sub-Committee of the Higher Education Funding Council's Libraries Review. Advances in these technologies are being investigated by the committee as part of its wider analysis of library provision and the purpose of this paper is to provide an outline of the key technical developments in this area and their potential impact within Higher Education.

The paper begins by looking at some of the pressures on the library service in universities, and suggests that traditional publishing technologies have contributed to those pressures. Some of

the major advances in electronic demand publishing are then described, leading to a review of how these technologies are now being introduced into Higher Education both in the UK and the USA. A final section highlights issues which will need to be addressed if the potential of the technology is to be fully exploited.

We would stress that this document, and the details of the CLASS project contained within it, represent a vision of the future based on current trends in technology and not a commitment by Rank Xerox to deliver specific products or services.

Background to Rank Xerox

Rank Xerox (UK) Ltd. is part of the worldwide Xerox organisation, whose total annual revenues are in excess of \$19 billion. At least \$1 billion is invested in Research and Development each year. The UK company employs approximately 4,500 staff and has an annual turnover of around £500 million.

Since the 1960's, Xerox has been at the forefront of Information Technology developments, many of which have emerged from the company's Palo Alto Research Centre (PARC). These have included major advances in laser printing, graphical user interfaces, client/server computing architectures and facsimile. Xerox was a co-developer of Ethernet networking, and owns Kurzweil, one of the world's leading companies in intelligent scanning. Xerox's Ventura Publisher is one of the most popular Desktop Publishing software packages. Xerox is currently recognised as a leading company in demand publishing technologies. A European research centre (EuroPARC) was established in Cambridge in 1986 and in 1992 a new centre, specialising in language technologies, was opened in Grenoble.

In Higher Education, the company has been at the forefront of joint work with universities on a number of technological projects, including CLASS (College Library Access and Storage System), which is described in more detail later in this paper. In the short time since the UK launch of Xerox's DocuTech electronic production publisher, many educational establishments have invested in this equipment.

Pressures on the higher education library service in the 1990s

The UK Higher Education library service is facing many pressures including:

- serious cost constraints
- increasing numbers of students whose needs for teaching and support materials must be met.
- a growing number of organisations with 'university' requirements for library provision, including requirements for access to the research resources of some of the longer established universities.
- a proliferation of increasingly specialised publications, which combined with the rising costs of certain publications, particularly Science, Technology and Medical journals, is creating a growing gap between the material published and universities' ability to pay for it.

- space constraints within libraries
- in some university libraries, particularly those with unique collections, problems with the physical deterioration of the holdings as a result of acidic paper.

As we understand it, the Follett Review has the broad objective of looking at ways in which the current resources of the university library system can be preserved, shared and, where appropriate, expanded within the above constraints.

The I.T. Sub-Committee is investigating the specific role that emerging technologies, in areas such as demand publishing, can play in meeting this objective. It is willing to consider radical new approaches to information provision within the library function, provided issues of cost and practicality are addressed. This could involve not just new technologies, but also changes to the way current publishing and copyright arrangements operate.

Traditional publishing structures and technologies

Publishers carry out a range of functions in book and journal production, including commissioning, editing and distribution, all of which are reflected in the final cost of a given publication. However it is the current nature of the printing process which has perhaps contributed most significantly to the pressures academic libraries are facing.

Offset lithographic printing methods have traditionally been at the core of volume book and journal production and have offered many benefits including cost-effectiveness for long production runs, a high quality of output and the ability to use colour. Much academic publishing, however, involves short run, black and white publications aimed at a small audience of specialists. Here, offset litho printing has a number of disadvantages.

From the publisher's point of view, the printing process has many complex stages, involving composition systems, phototypesetters and plate production before the publication reaches the offset press (see *Figure 1*). Set-up costs make it very costly to produce short run publications and often uneconomic to reprint when an initial edition has sold out or where the content of the publication has changed, even where demand for the publication still exists.

Publishers have tended therefore to print minimum volumes of a publication, with the attendant risk that sales targets will not be met or that sales will be very slow and unpredictable. The decision to publish becomes a very significant one. The process also produces a physical object which needs to be warehoused and managed. Keeping an extensive catalogue of publications adds to the publisher's overheads. Prices reflect all these risks and costs.

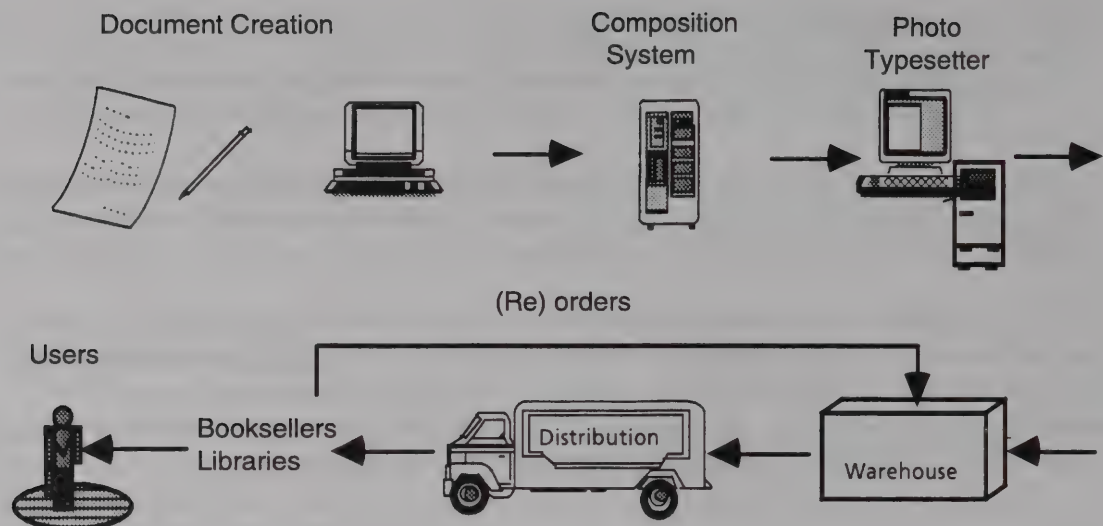


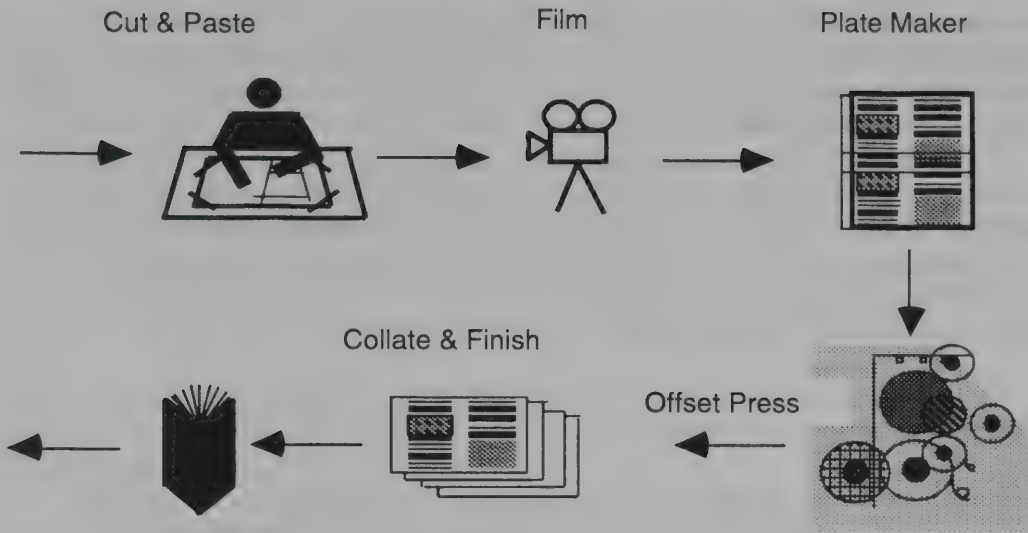
Figure 1 - Current publishing production process

From the academic's point of view, the publishing process can be perceived as a bottleneck. Many valid articles do not actually get published because editors judge that the interest in them is not broad enough to justify the costs of publication. Where articles are accepted for publication, the delay before they appear in print can be long, partly because of the peer review process, but also because of the printing methods involved. When publications do emerge, the information is often out-of-date, particularly in research areas where change is rapid.

On a day-to-day level, if a lecturer wants to put together a set of course notes, he/she will need to write parts of the material to ensure it reflects the latest thinking and (unpublished) research. Moreover, the ability of the lecturer to mix-and-match parts of different publications is dependent on photocopying, with an inevitable degradation of print quality as copies are taken of copies.

Finally, from the librarian's point of view, there is a physical object to purchase, store and manage. The growth in the rate of publication of new material is great, and libraries are finding it increasingly difficult to fund the acquisition of this material. Limited finance is available for the construction of new library space. Joint collection management is potentially attractive as a concept but currently the main way of gaining access to publications held at other libraries is through the physical transfer of material, or copies of it, via inter-library loans.

In short, the combination of the particular nature of academic publishing and the type of printing technology available has almost inevitably led to a costly and inflexible structure for information delivery.



Advances in electronic demand publishing

Advances in a range of digital technologies are now creating an electronic infrastructure which makes possible new forms of publishing and challenges some of the traditional methods and structures. These technologies are powerful enough to handle effectively the size and complexity of document images and include:

- processor architecture and database technologies
- high speed networks
- digital storage devices
- production scanners
- digital production printers

The development of document standards are an integral part of this infrastructure.

Processor architecture and database technologies

The development of networks, together with massive increases in processor power and increased flexibility in software design, has had a radical impact on the base architecture of today's information system. Rather than working from a 'dumb' terminal which is connected to a shared mainframe computer, people can now work at high performance workstations which are in turn connected, via the local area and wide area networks, to an array of databases which offer access to vast stores of information. This trend in computing is supported by what is commonly referred to as client-server architectures where a client device (*e.g.* a user's

workstation) can request a service from a server (*e.g.* a networked mini or mainframe computer). In turn, the server may take on a client role, on behalf of its own client, in order to request information or services from another server, should it not immediately be able to deal with the original request itself.

The concept of a central database is therefore losing validity. In the future, information will no longer need to be stored in one central location; instead it may be widely distributed amongst many different database servers. The person who requests information will need to know nothing about the supporting infrastructure which may actually be obtaining information from physical stores located in several continents.

High speed networks

With the advent of local area network technologies and wide area networks based on fibre optics, it is fast becoming feasible to implement systems where the location of data and information is virtually irrelevant and users have potential access to a 'global' database of information.

Within the UK Higher Education system, the use of high speed wide area networking technologies is being adopted to implement SuperJANET, effectively an upgraded form of the existing Joint Academic Network which is already widely used by most UK higher education establishments. The advantages of SuperJANET over the existing JANET network will primarily be its high bandwidth, which we understand will offer users transfer rates in the order of 625 million bits per second.

SuperJANET will be used to transmit voice, data and images. It is designed to support applications such as electronic publishing and library document distribution as well as high performance computing, distance learning, medical imaging and multi-media information services.

Digital storage devices

Until recently, the cost of digital mass storage devices, coupled with their physical size, ensured that this technology was only realistically available in large, centralised computing environments. With the significant downward trend in storage costs, and the improvement in both magnetic and optical storage technologies, it is now both practical and cost effective to provide the networked storage devices required to support the client-server model of computing described above.

Magnetic devices still play an important role and will usually be used for on-line storage of information for (relatively) immediate access, as a temporary repository for information that is destined for storage on alternative media (*e.g.* optical disk or tape) or temporarily to hold copies of sections of a physically remote database as information is requested by a user. Optical disks will typically be used as either an archival medium or as a way of keeping information in a state where it can be accessed relatively quickly but not necessarily immediately. Depending upon the application, information that is retrieved from an optical disk

'juke box' may be delivered to the user some time after the original request has been submitted. Optical disk capacities vary depending on the size of the disk, but, with the use of juke boxes which can hold up to 100 disks, it is already possible to configure storage devices with capacities of 200 Giga Bytes, which represents the electronic equivalent of something like 4 million A4 sides of text. Or, to give another example, using dismountable optical disks it is possible to store 900 electronic library books on 2 feet of shelving. Over time, it is expected that the cost of this technology will continue to decline and capacity will increase.

Scanners

More material is being created in electronic form. Nevertheless, there is still a growing requirement to be able to capture electronic facsimiles of material that is currently held in paper or film originals.

Although full-scale 'production' scanning is still in its early stages, scanner technology itself has advanced greatly over the past few years both in terms of its physical productiveness and cost effectiveness. Many organisations will now find it feasible to acquire their own scanning equipment to scan and capture documents for archival or other purposes. Where the cost of acquiring the capital equipment outweighs the benefits, bureaux services are now emerging to provide scanning services.

Scanners today are capable of scanning in monochrome for black and white text; in greylevels for scanning black and white photographs or half tones (printed pictures); or in full colour for photographic material (paper or film). The quality of the scanned image which appears on a screen or in print is directly related to the resolution of a scanner (calculated in number dots per inch, or dpi). Current scanning technology is generally capable of scanning at resolutions of between 200 dpi to around 1200 dpi. Higher resolutions are possible but these are traditionally used only for the reproduction of very high quality colour images in glossy magazine.

Scanners are increasingly being designed to offer other features which will improve their document handling capabilities. These features include automatic duplexing (scanning both sides of a page) and skew detection; image enhancement; 'intelligent' recognition of print screens when scanning printed half tones; and the ability to feed from a stack of pages. Scanning systems with 'Intelligent Character Recognition' (ICR) can convert images to editable text from which key words or phrases can then be retrieved, and some scanners can be programmed to recognise and classify documents such as forms by their shape.

Digital production printers

Traditional offset presses are fast being replaced by digital production printers, such as the Xerox DocuTech (*Figure 2*), which are capable of printing, on demand, publications which are stored as electronic images or in the form of a page description language such as PostScript. These printers are now being produced in a range of sizes and are designed to be connected to networks.

Digital print engines will produce a range of output at production speeds. Typically, print resolutions range from 300 up to 600 dots per inch, allowing photographic half tones to be successfully reproduced as well as fine line diagrams. Highlight colour output is also now available. Digital images from a variety of sources (*e.g.* scanned, loaded via floppy disk or sent over a network) can be accepted, stored, retrieved, merged, cropped, rotated and reformatted on screen before being printed. The print engine will usually include some finishing options such as stitching or binding, but a range of other devices can typically be connected, including for instance booklet makers.

Document standards

As publishing technologies have advanced, so the need for common standards has become more pressing. In addition to the common networking and operating system standards, many standards for electronic documents now exist, whether *de facto* or agreed formally at international level. They include:

- Standards for Document Architecture *e.g.* SGML or ODA, which define how the chapters, sections, paragraphs *etc.* will be represented
- Standards for Page Description Languages *e.g.* PostScript, which defines how document images look either on a screen or when printed
- Standards for Image Compression *e.g.* CCITT G4, which define how document images will be stored

Some of these standards are complementary but many still conflict. All can be expected to evolve as technology develops.

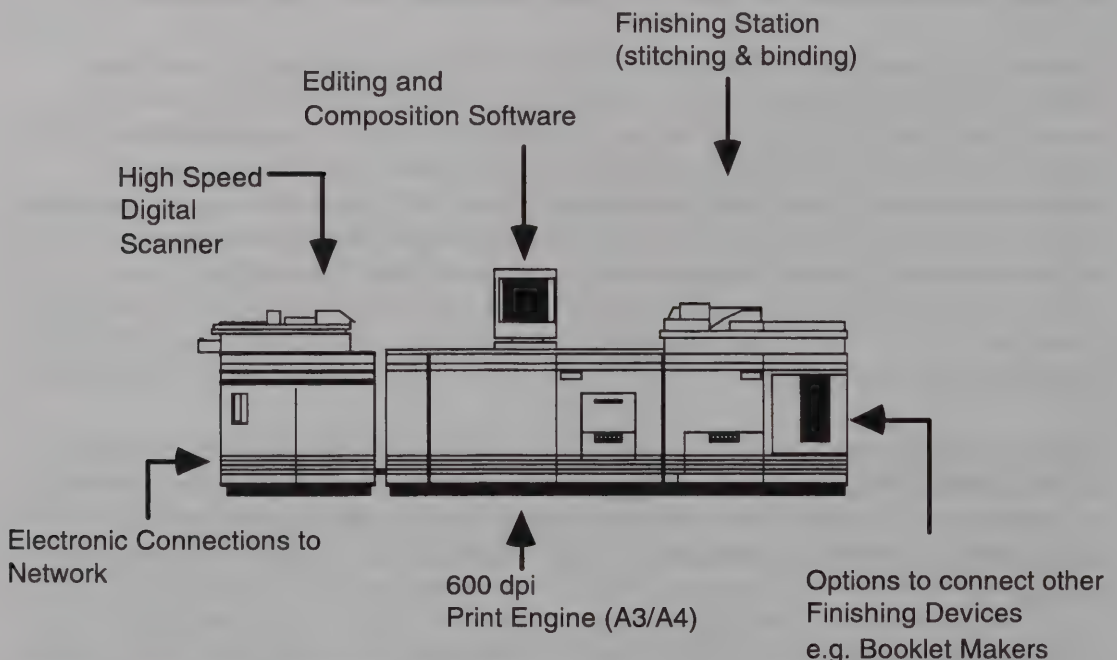


Figure 2 - DocuTech Production Publisher

The implications for the future

These advances in a range of complementary technologies offer the potential radically to simplify the publishing process and to revolutionise its economics, particularly for short-run, black and white publications. The ability to create and print electronic documents without any of the intermediate stages required by offset; to bring together electronic documents from a variety of sources, including geographically dispersed databases; to 'warehouse' them electronically ready for recall and printing on demand; all of these offer possibilities which are only just being glimpsed:

- publications will be produced 'just-in-time'. Information in its most up-to-date form will be printed quickly when requested rather than being published in advance in the hope that it will one day be used
- information will be tailored to the needs of the reader. It will be feasible to print a couple of pages rather than a whole book. There will be environmental and cost benefits
- the enormous duplication of hard-copy material in libraries may be reduced if publications can be stored electronically and printed on demand

Two areas are worth exploring in more detail: the effects on the publishing industry; and the concept of the electronic library.

A revolution in the publishing industry ?

It is clear that even in the short term, these technologies will free academic publishers to reconsider how they manage their catalogues. In many instances, publications which are still in demand need no longer be forced out of print by the economics of the offset printing process. Initial production runs can be reduced and issues reprinted cost-effectively on demand.

But why should publishers continue to organise the printing process? A new model of publishing may arise where, under controlled conditions, publishers supply organisations like universities with the electronic master of a publication. The universities themselves can then print from the master as required, paying copyright and use fees automatically to the publisher. Discussions on these lines are already taking place in both the USA and the UK.

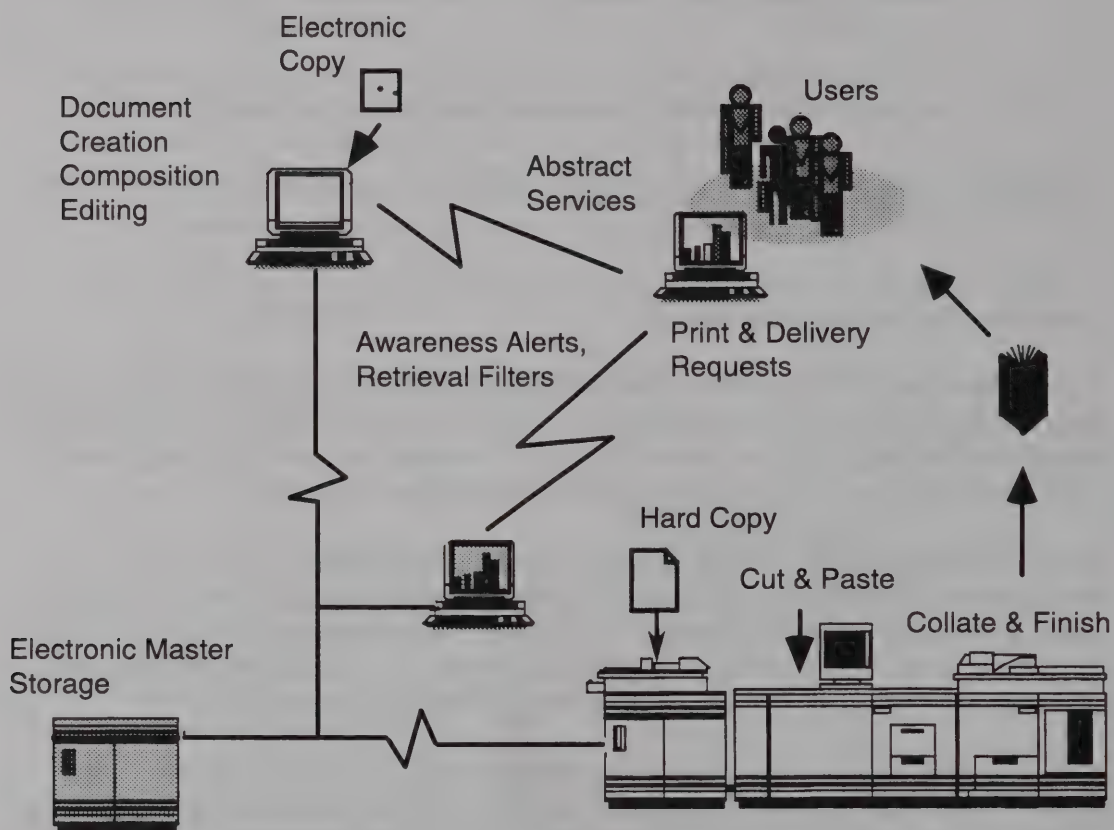
In the long-term, the role of the academic publisher may itself come under question. Why channel publications through an intermediary such as a publisher when an author can make his or her most up-to-date work available for viewing and printing electronically over a network? One can begin to envisage a national or even international academic document base, into which lecturers place articles or 'contributions' to textbooks. Depending on the wishes of particular academic communities, the documents could be passed through some form of peer review, or it could be left to individual lecturers to decide what to enter on the databases.

When a lecturer needed to produce course notes for his or her students, it would be a matter of interrogating the relevant bibliographies, viewing and requesting electronic copies of all or parts of the documents identified as useful, and printing a set of notes at a convenient location.

Copyright charges could flow directly to the author, with a percentage taken off to cover the administration costs of the electronic infrastructure.

Clearly the current role of the publisher would alter. Publishers might concentrate on selling their traditional editing, layout and marketing skills to authors, who would want to ensure that their electronic documents were attractive. They might act as agents on behalf of academics, or as suppliers of specialist bibliographic services and even search and retrieval software.

Figure 3 - Electronic production publishing process



Developing the Electronic Library ?

The system of electronic publishing outlined above would form the basis of an electronic library which could be browsed and viewed remotely. But there would still be a tremendous backfile of hard copy information to which researchers in particular would want access.

Here again one can envisage a series of specialist bibliographic and support services being developed, perhaps at the major university research centres, or at some central location. Once a researcher decided that he or she needed all or part of a publication currently held in hard copy, the document would be digitised in a production scanning environment. It could then either be printed at the point of scanning or transmitted over a network for local printing. The scanned image itself could then go to form part of a wider electronic library, which would also incorporate electronic documents created in other ways. Over time, as the volume of material built up, more and more research requirements could be met by transferring electronic images, rather than physical documents, between universities. Research activities could begin to take place without geographical limitations.

Exploiting the new technologies in higher education

Demand Publishing in the UK

Although discussions about a revolution in the publishing industry and the concept of the digital library may seem premature, many elements of the core technology are already available in the UK. As could be expected, commercial printers are investing heavily in digital production printers as a way of streamlining their printing processes. However many Universities and indeed Colleges of Further Education are also buying electronic demand printers to complement their other investments in networking and databases.

Typically these machines sit within the university print or media services department and have been cost justified on a strictly commercial basis based on the DocuTech's ability to show cost savings against existing copying or offset equipment. Typical applications are short run, black and white print jobs including the production of course notes, academic papers and departmental prospectuses.

The corporate and strategic implications of the technology are only just beginning to be addressed in most universities in the UK. However projects in the United States in which Xerox has worked with universities have begun to show how this technology could be exploited within the Higher Education library function. The most significant of these is the experimental CLASS project at Cornell.

CLASS (College Library Archive and Storage System)

The Olin Library at Cornell and Cornell Information Technologies, supported by the US Commission on Preservation and Access, have been involved since December 1989 in a joint project with Xerox to determine how digital technology could be used to enhance library services and educational publishing.

The prime research effort at Cornell was initially directed towards the preservation of information within brittle books, but the project eventually expanded to encompass other areas as it became clear that the digital technology could have a dramatic impact on the role and operation of the library function.

The CLASS system (*Figure 4*) was designed around the networking, scanning, storage and printing technologies and the client/server computing architectures described earlier in this paper. Cornell's campus-wide TCP/IP network formed the main backbone for the system. As far as possible, the designers avoided using any non-standard image file formats, data compression standards or network protocols.

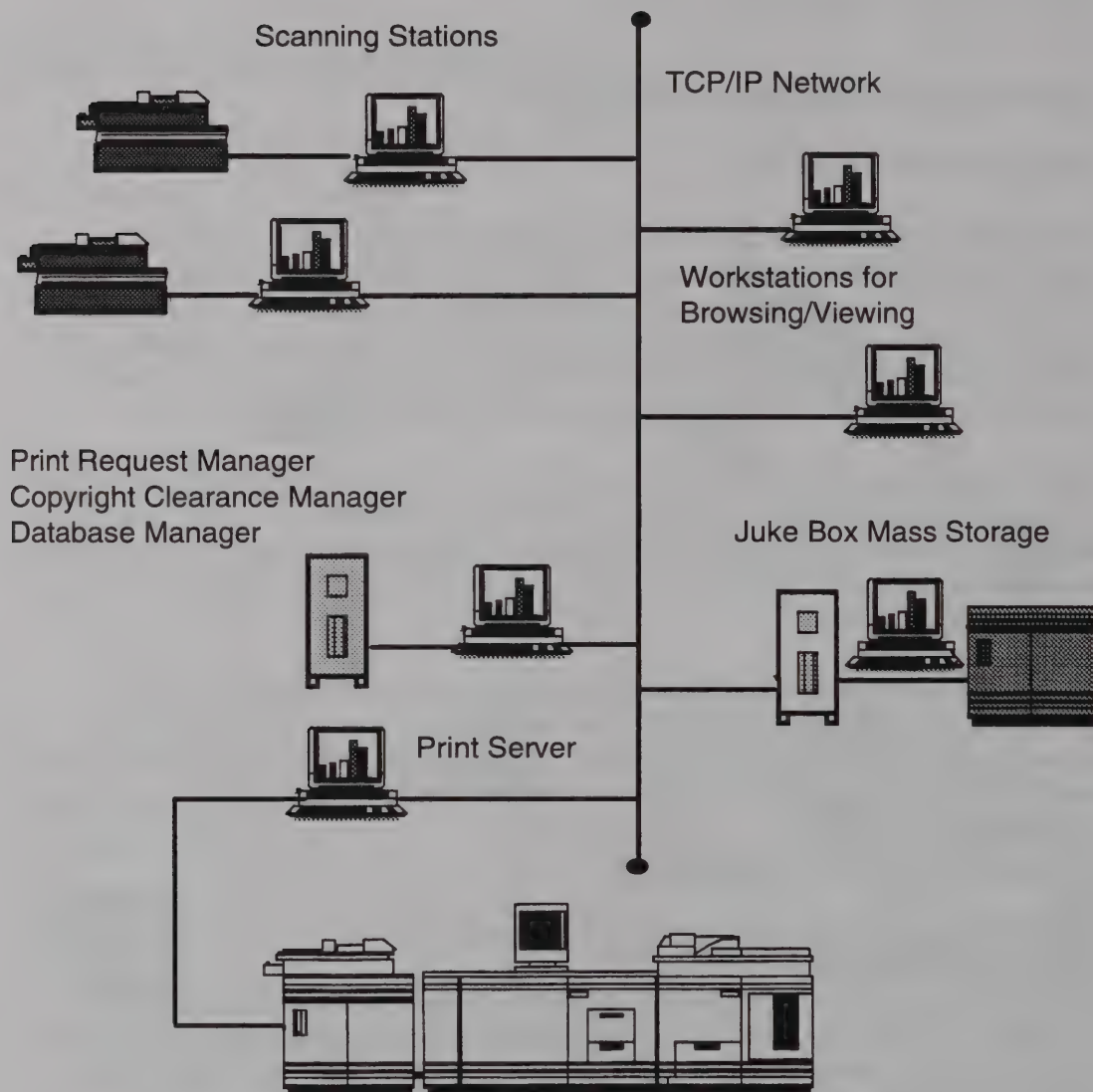


Figure 4 -CLASS schematic

Specific software modules were developed to manage the electronic documents within the system and to carry out functions such as:

- maintaining a list of documents known to the system and the means for locating these documents
- providing a means for transferring and deleting these documents
- providing a means for creating, deleting and editing the structures contained in these documents
- providing the means for a user to 'browse' a book, for instance by reviewing its contents page, indexes and other chosen parts
- controlling the security of the system
- controlling the integrity of the system so that for instance the fact that a document has been moved within the system was reflected in the catalogue

Some areas of software development were also identified, such as electronic copyright clearance, which will require longer-term work and negotiations with external agencies.

A key task was to ensure that books captured electronically retained the same structure as they had in their physical form and that, for instance, electronic page numbers reflected the printed page numbers in the original publication. Part of the project therefore involved designing a logical 'Document Architecture', appropriate to the material being scanned.

The main results of the study have been as follows:

Brittle books

Some 1000 books from the university collection were debound and their contents scanned in and stored as 285,000 digital 'pages'. The actual structure of the electronic book was determined by the operator and a quality assurance facility was provided to ensure that the scanned material met library standards. The overall re-scan rate was 1% of all copies made and the scanning process was found to be cost-effective compared to micro-filming. The subsequent printing of the images through a production publisher was also found to be cost-effective and users of the collection and library staff were very enthusiastic about the quality of the resulting documents.

Equally important, access to the digitised collection was available much more readily than if the images had been held in other preservational media such as microfilm. Remote access to the images was made available via workstations, with the option for viewers to request prints of the images. The quality of the screen images was found to be acceptable for browsing and retrieval. This aspect of the project therefore offered a prototype of a digital library and the digital books were in fact catalogued in both Cornell's own on-line catalogue and the US Research Library's national database.

Custom course notes

Course note publishing is a major concern for Cornell. Typically lecturers provide a range of photocopied materials, adding about 25% of the final document themselves. Volumes in the early days at Cornell were around 4 million prints for the Spring semester, printed over 4 week period, with another print run of 6 million prints for the Autumn semester. Total annual course note production is around 22 million prints and growing.

The CLASS system has allowed Cornell to manage the production of these notes more effectively than before. Information is scanned into the system but can also be retrieved from electronic sources where these are available. The sort of material which is scanned can include hand-written notes, photographs, diagrams, drawings and typed reports. Once entered into the system, these materials can be brought together in a managed fashion as a course pack ready for publication at the beginning of term.

Where new elements need to be included in the pack, they can be scanned or retrieved electronically and incorporated into an updated pack, which can either be issued as a complete new pack, or as a supplement to the existing pack. As CLASS technology spreads, the idea of building anthologies from distributed images held around the university system is looking increasingly possible. All the published material can be linked to departmental cost codes to re-allocate costs to departments if required. Students are asked to pay 12c a sheet of which 4c is a copyright fee.

In the USA, Xerox is co-developing a copyright management system with the Cornell University Bookstore. Other parties involved include the Harvard Business School and the National Association of College Stores, which operates a copyright clearinghouse for its members. Recently the Copyright Clearance Center has begun to show interest in the project.

Out-of print books

Cornell University Press has now begun experimenting with Cornell Classics on Demand, where out-of-print books would be scanned and offered for sale on a print-on-demand basis through the Campus bookshop. Books need not go out of print, and this initiative opens the way to distribution of books or parts of them by disk or Electronic Mail, or even for potential purchasers to view parts of books via a workstation before ordering a reprint.

Negotiations with publishers

Cornell and a number of other universities are now participating in a multi-institutional project with Elsevier, the largest commercial publisher of technical journals in the US, to experiment with the electronic distribution of material science journals. At Cornell, these journals will become part of the digital library, and the viewstations that support the browsing of digitally preserved books will also support the browsing of Elsevier journals. In parallel, a coalition of engineering colleges (the Synthesis Coalition), based at Cornell, is engaged in a joint study with John Wiley and Sons Publishers to experiment with the electronic viewing and use of engineering textbooks. Again these books will become part of the digital library.

Other US initiatives

Although the Cornell system is perhaps one of the most extensive exploitations of the new technology, there are a number of other interesting projects taking place in the USA. These include:

Harvard Business School

The Publications Division of the Harvard Business School was recently established as a separate business, the Harvard Business School Publishing Group. It is working with Xerox and CLASS technology to capture 7500 of its case studies which can then be reprinted on demand.

Yale Open Book Project

This project, again involving CLASS technology, involves the digitising of microfilmed or hardcopy books to provide on-line access to electronic document collections for authorised users.

Primis

This system was developed by McGraw Hill in conjunction with Kodak, with the objective of providing customised books from McGraw Hill material.

Issues

Clearly rapid changes in technology and organisational structures create challenges and many issues will need to be addressed before the full potential of the new document technologies can be realised. These include:

Awareness

In Rank Xerox's experience, awareness of the full implications of these new technologies is growing only slowly at senior management levels within Higher Education, even in those organisations which are investing heavily in digital publishing equipment such as DocuTech. Meanwhile, suppliers such as Rank Xerox are actively involved in helping to define the particular requirements of this market sector. There is scope therefore for all parties to improve their understanding of how these technologies relate to the needs of the Higher Education system.

Technological progress

Elements of the technology are still developing. Scanning will need to become even more productive and cost-effective before the huge backfile of hard copy material in libraries can be digitised. In practice, a date may need to be agreed after which all new material being collected by libraries is as far as possible captured electronically. Even with the huge advances already taking place in storage technology, the implementation of larger scale electronic libraries will need to be carefully planned and managed.

We are still in the early days of being able to view and print from digital libraries or to move smoothly from a catalogue entry to a description of the contents of a book to the text of the book itself. One can expect software developments to continue in areas such as library management, copyright clearance and browsing, viewing and print management. Cornell is currently working in these areas.

The large scale management and distribution of electronic documents will depend for its success on common standards for electronic material. Multiple document structures may need to be developed to cope with different types of document (for instance magazines as opposed to books). Fragmented development of standards will impede progress. Cornell is seeking to agree standards with a number of institutions in the USA, and the HEFC may have a role to play in this area in the UK.

Security will be of major importance where intellectual property rights and an ever increasing proportion of a nation's intellectual heritage are held digitally, or where copyright payments are being transferred electronically.

Finally, a particular concern for libraries, with their role of preserving information over the centuries, is that technological capabilities and standards are changing rapidly. Recognising this, Cornell is planning regularly to refresh its optical libraries but it is clear that the rapid development of technology will remain a major challenge for all libraries.

Publishing and copyright arrangements

The new technologies present a potential long-term challenge to the publishing industry as it is currently structured. However the experiments with Elsevier and Wiley in the USA suggest that universities and publishers could work together to exploit these technologies. This could open the way to discussions, preferably at national level, perhaps led by the HEFC, on areas such as copyright permissions and payments and how these could be supported by technology.

Bibliographic and preservation standards

The work at Cornell raised questions about what changes might be required to current bibliographic and preservation standards in order to cope with digital books. It was found, for example, that whereas traditional bibliographies referred readers to a whole book, users of an electronic book might only want access to parts of the publication. There was also a need, in the US, for digital technology to be recognised at national level as a legitimate preservation

technique, whilst the inter-relationship of digital records with microfilm was only just beginning to be explored.

Navigation around document bases distributed amongst many organisations and many locations will present major challenges. Even discovering the existence of a particular document may be difficult. The development of effective electronic search and retrieval mechanisms, including bibliographies and abstracts, will need to be addressed in ways which will allow academics and researchers to identify what is useful and relevant to them from the flood of digital information.

Organisational strategies

Finally, securing best value from these technologies, and justifying their costs, will require different parts of a university, including the library, computing and print functions, to agree a common strategy and approach. Indeed, if different universities, possibly in different countries, are to share information and resources, an equally integrated approach will be essential. Cornell identified the need for universities, their national associations, standard setting organisations, technology vendors, funding bodies and service bureaux to work together. There is therefore a major management task ahead.

Further Information

For further information about the contents of this paper and Rank Xerox's activities in the UK, please contact:

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The Information Skills Project

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Introduction

The past few years have seen a rapid growth in the amount of information and data available in electronic form as well as an increase in the use of facilities such as electronic mail to communicate information between student and teacher. Alongside this growing use of electronic information and data sources is the increasing recognition that information technology and information handling skills are necessary components in the life and learning skills of the student in higher education.

In order to encourage the development of student information skills the Information Skills Project was established at the University of Sheffield. The Information Skills Project represents a joint undertaking between the University's two main information providers (Academic Computing Services and the Main Library) and the Enterprise in Higher Education Initiative.

The main aim of the project is to establish IT as a tool for teaching and learning, to encourage all students to acquire information handling skills and to ensure that such skills are integrated into academic courses and the provision of training by information providers such as The Library and Academic Computing Services.

Background

There are many changes occurring in higher education in the UK with plans for increasing access to greater numbers of students as well as the provision of a much wider range of modes of study. There are to be larger numbers of students on part-time courses and an increase in students being taught through methods of distance learning. This increase in numbers has a significant effect on the demand for resources provided by The Library and Academic Computing Services and also heralds a reduction in contact time between lecturer and student. There will be a need for more emphasis on independent study and information technology is seen by many as holding the key to organising this independent study through the use of programmes of computer assisted learning.

There is also the feeling, quite rightly, that information technology and information handling are important skills in everyday life and that they will be vital in the future working life of the student. Therefore all students should be equipped to enter the world beyond University as competent users of IT.

Thus, the need to develop student information skills is twofold, in the first instance the increasing numbers of students entering higher education will *stretch* existing teaching resources. In this case computers offer a supplementary means of learning as well as providing information bases for the storing of administrative details about courses, modules, assessment requirements and so on. Secondly, the needs of employers and in the world in general demand that students should be capable of using information technology and developing own information handling skills.

These are both perfectly valid reasons why we should encourage the development of information skills, however we also need to consider what other value the teaching of information skills might hold for University education. We need to look beyond the restricted view that computers can be used as repositories of self teaching material which the student will work his/her way through, towards the ways IT based information skills can assist us in the development of academic skills and the way they can then be used to enhance learning in Universities.

As University teachers we focus on the development of intellectual skills at a meta-level. We encourage students to develop their critical faculties and their ability to infer meaning and to convincingly articulate that meaning. If we are to make best use of information technology in these same terms of encouraging academic creativity and enhancing scholarly pursuits then we must develop the meta-skills associated with information handling. Information skills should be developed which enable the student to gain a better conceptual understanding of the information with which they are dealing. That means focusing on the nature of the information being used and selecting the most appropriate way of visualising or modelling that information in order to convey meaning.

The teaching of basic IT based information skills has often been reduced to the teaching of individual software packages. For example a common approach has been to teach students how to use particular word processor, spreadsheet and database packages with little regard to when and how such packages might be used by the students in their academic studies. Simply changing the data used in the examples from say financial data for a business studies student to population data for a geography student does not immediately mean that learning how to use a spreadsheet package becomes any more relevant to the student or appropriate in the context of their academic studies.

It is a fundamental belief of the Information Skills Project that it is more important to provide the student with a greater conceptual understanding of the role of information, of the ways information can be modelled and of the generic features of types of software package than a key-stroke by key-stroke approach to a selection of proprietary software packages.

Having decided that it is desirable to encourage a higher level of IT based information skill there is still need to ensure that the student develops the basic technical ability to use the wide range of information handling technology available to them. There are significant problems

associated with the teaching of basic IT skills which must be addressed before we can hope to see all students developing their IT based information skills.

The initial problem concerns the level of IT experience of the students when they arrive at University. Although there is a much greater use of IT in schools the number of students who enter higher education as competent users of IT is still small. A survey of History and English Literature students found less than fifteen per cent of students had previously used a computer and of that number very few would consider themselves to be confident users of the technology. Discussion with colleagues in Pure Science and Engineering departments reveals that the picture is not very different there, in spite of beliefs to the contrary. As IT facilities are now more readily available to school students this problem should lessen. However with the planned increase in student numbers and the increase in non-traditional students the problem of students entering University with few basic IT skills could still exist. It will therefore be necessary to provide some means of providing these students with the basic IT skills.

At the University of Sheffield as in many UK Universities the range and diversity of use of electronic information and information technology is extremely wide. Some departments have traditionally used IT and have developed their teaching to make use of the facilities available within The University. Other departments are just beginning to introduce IT into the curriculum.

This highlights another problem, which is that many of the teaching staff are themselves new users of information technology and are not always aware of the possibilities available to them. Therefore, if we are to hope to make IT an integrated part of all course provision there is a need to support teaching staff in the development of their understanding of IT and of the ways which IT can be integrated into the curriculum.

The Information Skills Project Plan

The original plan for the Information Skills Project was to produce self teaching materials for the students to enable them to learn how to use the various IT packages available within the University. However if we are to hope to make IT based information handling an integral part of all courses there is a parallel need to provide training and support for teaching staff on the ways IT can be introduced into the curriculum and to help them address the pedagogic issues surrounding the introduction of IT such as the assessment of IT based course work and the evaluation of courses.

Therefore it was decided that the objectives of the project are as follows,

A. to design a basic IT skills programme

The basic programme takes the form of short tutorials and exercises which can be picked up as self learning material by individual students or taught by departments. This will enable all students to acquire the basic information handling skills. The philosophy of the programme is based around the concepts of information and that IT skills relate to three areas of information handling which are information acquisition, information preparation or visualisation and information presentation. The model for this basic information skills programme is outlined later in the chapter.

B. to support staff in the use of IT in teaching and learning

A series of booklets are planned to help teaching staff plan and develop the effective introduction of IT into their teaching. The initial booklet takes a look at the facilities which exist at The University of Sheffield and the ways these facilities can be used. Subsequent booklets focus in greater detail on specific types of packages or information based activities.

In conjunction with the University Staff Training and Development Unit a number of training events will be staged which address the pedagogic issues of using IT in teaching.

An interest group has been established which draws together teaching staff from a wide range of departments to discuss developments in IT teaching, to demonstrate new facilities and to share project information and experiences. The members of this group also act as information sources within their own department and arrange similar activities for their colleagues.

C. to establish exemplars of IT as a tool in teaching and learning

The Information Skills Project works very closely with a number of departments to help establish examples of good practice surrounding IT in teaching. These exemplars form case studies for other departments considering the introduction of similar activities and the material and documentation from each exemplar is made available to all other interested departments.

A model for describing information skills

Before we begin working on the curriculum and the integration of IT skills we need to gain a clearer understanding of the nature of IT based information skills.

The philosophy of the Information Skills Project is to look at information from a conceptual and functional viewpoint and to then select the most appropriate tools for handling that information. Thus, the student must firstly be introduced to the notion of information per se and then to the tools and techniques which are available to enable them to access and model that information. That is, that the student has an awareness of the nature of the information and the possible ways that information can be handled.

The following model is proposed as a means of conceptualising IT based information handling and as a framework around which to hang the basic information skills.

The Information Skills Model

Information skills can be divided into three main groupings, these are:

- i. Information Acquisition Skills

- ii. Information Preparation/Visualisation Skills
- iii. Information Presentation Skills.

Information Acquisition Skills

These are the skills involved in searching for, and acquiring information stored in an electronic form. This could involve the searching of databases of bibliographic information or the searching of full text databases for particular articles or academic papers. It could involve the retrieval of data from data sets, for example the UK Census or Government Statistics on economic indicators and voting patterns. The student needs to be aware of what information is available and how to retrieve that information. Thus, the skills surrounding Information Acquisition are those such as the use of electronic mail, the ability to search for and retrieve information from locally and remotely located databases, an awareness of what electronic information is available and where it can be found. The skills involved in acquiring information involve the student in finding information, selecting that which is appropriate and saving that information locally so they can begin to use it in their own work.

Information Visualisation/Preparation Skills

These are the skills involved in the modelling of the raw data, be it text, numerical, graphical, audio or video. The skills involved are those concerned with deciding how to model the information and the selection of the most appropriate tools for the task. This also includes knowledge about the interchangeability of data between packages and the conversion of data from one form to another, for example, converting numerical data into graphical representations or organising text based information into structured databases.

Information Presentation Skills

These are the skills involved in transforming the visualised information into a suitable format for presenting that information to others and to convey the meaning of the information. These could be the skills involved in for example, word processing, in publishing documents, in creating a hypertext system or in selecting the most appropriate form of graph or mathematical model.

Summary

By adopting a more abstracted view of information skills the student is encouraged to think about what they are trying to do with the information they have acquired and to gain a wide enough knowledge of methods and techniques available to enable them to make an informed choice about the selection of a method of visualising or presenting that information. This will achieve the desire to help the student gain a better conceptual understanding of information and the role that information plays in his/her academic work.

Information technology is not simply an alternative means of doing existing tasks but a very enabling technology. This must be highlighted so that students can make the most of the available technology and electronic information to enhance their learning.

Information skills can provide the student with a new freedom to think about the nature of information as well as the means to manipulate and model that information.

Information skills can enable students gain access to previously restricted information. For example one of the curriculum projects at the University of Sheffield involved the development of courseware which contained tables of British Social Attitudes and British Election Survey data which was previously only available to users with access to a mainframe and network connections to the University of Essex mainframes. This placed data in the academic public domain which had previously only been available to a restricted number of specialists. The data enables the undergraduate student to consider the social values and electoral influences of the Thatcher decade in a way previously unavailable to them. They can view the tables of raw data, download the data and create new cross referenced tables, load the data into a statistics or graphics package to visualise the underlying trends. From this they can use the information to answer questions and pursue general themes of political science. Whilst developing skills as a political scientist the student is acquiring the basic transferable skills of information acquisition, visualisation and presentation from within the context of their academic discipline.

Other splendid examples of the way IT based material can be used to exploit intellectual questions can be seen in the use of CD-ROM based packages such as CD-WORD, the Patrologia Latina Database and the English Poetry Full-Text Database where the student can view documents, commentaries and dictionaries. The related software makes searching for the relevant information much less time consuming than looking through the paper based documents, releasing the student to concentrate on the nature of the information as well as enabling the student to carry out statistical analyses, concordances and to search for concepts. There are many other examples of how information technology can enable the students to view information in a more holistic manner and thus increase their conceptual understanding of their chosen academic domain.

By focusing on information skills as a vital set of tools for enabling students to handle information in a more effective way we are beginning to overcome the cultural barrier where many Arts and Social Sciences students have viewed information technology as something either for number crunching and engineering drawing or at best as an alternative to using a typewriter.

By taking the training of teaching staff into account the Information Skills Project has harnessed the enthusiasm of some extremely imaginative teachers who have help to spread the use of information skills in academic departments which previously made little or no use of information technology in their teaching. The Information Skills Project, Academic Computing Services and The University Library produce a wide range of material to help the students acquire the basic IT based information skills leaving the academic departments to focus (with the assistance of the Information Skills Project) on the ways electronic information can be most appropriately used to support the academic development of the student.

It is encouraging to see that the views of teaching staff towards the teaching of information skills has changed and that it is now more widely appreciated that by integrating IT into the curriculum that students not only acquire vital transferable IT skills but also have the opportunity to develop their intellectual skills further through being able to view their subject area from a higher level of abstraction.

Information Technology in the curriculum - a review of the Departments and Schools of Information Studies and Librarianship

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Introduction

This short paper is based on submissions from most of the Departments and Schools in membership of BAILER, and the pattern revealed is common enough to suggest that the overview would not be changed greatly by the inclusion of all departments.

'Information technology' defined

'Information technology' is perceived by most departments to include computer hardware and software, telecommunications and other aspects of networking, on-line database access, and specific applications in relation to library housekeeping and information retrieval. A number comment that IT is seen as a tool for many courses and it is suggested that the idea of 'computer literacy' does not define the approach taken in teaching - rather, departments are aiming to ensure that students can " demonstrate their competence in the use and understanding of IT in information and library work." (Loughborough University (LUT))

IT in the curriculum

IT appears in the curriculum in two different guises: first, there are courses in most responding departments that are devoted specifically to information technology, under the definition proposed above; secondly, many courses that deal with information sources and services, information retrieval, database design, business information, records management, *etc.*,

necessarily include treatment of the relevant IT issues and rely to a significant extent upon the use of computers and networks in teaching these subjects. For example, "...IT is heavily used in core teaching of Information Resources, Information Services and Management and integrated into specialist areas, as appropriate." (UCE Birmingham)

Given this two-fold representation of IT in the curriculum, it is useful to look at each in more detail and from the points-of-view of undergraduate, postgraduate, and continuing training.

Undergraduate level

At the undergraduate level the division referred to above applies quite clearly - a number of departments have a required courses in basic IT skills, through which students learn how to use word-processors, spreadsheets, and databases, and also how to gain access to networks. For example, at Aberystwyth, after following the basic introduction, all undergraduates are required to submit their work in word-processed form; at UCE Birmingham, all BA students have an intensive IT foundation course of 36 hours; at Thames Valley University (TVU) all undergraduates take a 15 week module on principles of IT and a further 15 week module on 'Tools of the electronic office'; and at Robert Gordon University (RGU) "...all students take a foundation course in information technology and its applications." University College London (UCL) plans to introduce a B.Sc. in Information Management which, "...will complement our existing courses, by encouraging students who have an interest in IT to learn the skills which will enable them to manage information effectively, rather than taking librarians and giving them IT training."

Having acquired a basic level of competency with standard tools, undergraduates are then exposed to more specialized applications. The range is too wide to permit a generalized picture to be drawn, but in all of the departments students can select from courses that enable them to gain competency in a selection of the following: database design, computer-aided design in library planning, online cataloguing, electronic publishing (including CD-ROM applications such as ADONIS) expert systems, hypertext, OPACs, videotex, desk-top publishing, and more. In all undergraduate programmes further specialization may be acquired by completing a final year project in some area of IT application.

Postgraduate level

The one-year postgraduate year does not allow the same kind of exposure to information technology as that for undergraduates. In any event, the proportion of students entering courses who already have some degree of computer competency is continually increasing - for example, at Sheffield University, some 40% of students have some competency on entry and, if overseas students are excluded, this proportion rises to about 60%. Even so, however, departments offer the same kind of pattern of courses at this level. For example, at Sheffield, Computers and information is a two-term course required of all students; at Liverpool John Moores University (LJM), Information technology is one of five compulsory units; at TVU the courses on Principles of IT and Tools of the Electronic Office are combined for the postgraduate course; at UCE Birmingham the intensive IT foundation course is extended to 40 hours for

postgraduates; and at Aberystwyth there is a "25 hour course on basic IT literacy using DOS 5 and Windows 3.1 and Works."

Beyond the introductory level, the same opportunity to cover a wide variety of IT applications applies as at the undergraduate level - with some courses serving for both groups of students.

Continuing education

The information from departments on continuing education is less detailed but, again, there is a discernible pattern of short courses, higher-level diplomas/Masters' degrees, and research degrees. Short course provision in this area has been affected by the increase in student numbers, increased student:staff ratios, and the difficulty of securing take-up at economic rates. There is no doubt of the ability of departments to offer continuing education in the area of IT applications provided that they are properly resourced to do so, but there is little evidence from the field that organizations are willing to pay the kind of fees that would allow more courses to be offered and little evidence that a sufficient volume of demand exists. At UCE Birmingham, however, perhaps as a result of having the second largest population in the country, "The School has offered a wide programme of short courses, aiming to work closely with local libraries... CD ROM seems to be the area where there is most interest in the profession, both in setting up CD ROM systems within the library, selecting the software and keeping up with new developments."

There is a modest level of demand for more formal continuing education, with a number of advanced taught Masters' degrees available, some with a specialization in IT (as at UCL, with its MSc in Computerised systems for librarians), others of a more general kind, which allow for specialization within the programme (as at Aberystwyth and Sheffield). The take-up for part-time research degrees is also modest, but when the research deals with any aspect of IT applications to library/information systems it allows the student to gain a considerable understanding of the chosen area.

Networks

All of the responding departments note an increasing use of networks in teaching - in many cases beginning with a network computer laboratory, linked to the campus network and thence to JANET, and INTERNET, and thence into Mailbase lists, LISTSERVE lists in N. America, CWIS, OPACs, BIDS, *etc.* LUT notes: "Also heavily used is the JANET/PSS gateway to access commercial information retrieval services not available on the academic networks, including Dialog, FT-Profile, Lexis/Nexis. Access to a CD-ROM network supported by the University Library is planned." UCE Birmingham reports that, "...students studying [the] Information Network module will devote considerable time to JANET, INTERNET, NISS, CWIS, Gophers/WAIS/WWW, *etc.*" This pattern of development is repeated across the departments and can be expected to increase in significance.

Resources

On the basis of data collected by the Heads of Departments & Schools Committee the average spend on IT is £168 per student. This is probably a severe underestimate because some departments use institution-wide or faculty resources and the proportion of these resources attributable to departments is unknown and a number of departments have amounts considerably in excess of that amount.

Several departments note a significant increase in resources in recent years; for example, "We have received approval for a new computer lab of 486s linked by Ethernet, connected to the College FDDI backbone." (UCL); at LUT there are four laboratories, each with ten machines and "Currently two laboratories provide DOS machines with serial network access, one houses Windows machines with Novell networking and the fourth provides Macintosh machines with Appletalk networking."; at UCE Birmingham, "The School now has two computer suites, one with stand-alone PCs, one with online facilities, a CD-ROM suite and a word-processing/desktop publishing suite, dedicated to LIS students."; at RGU Aberdeen, "The School has totally re-equipped two of its three computer laboratories at Hilton, each now containing 12 386 workstations with 8Mb RAM linked via an Ethernet LAN (Novell 3.1) connected to a twin 500MB file server. Two additional similarly equipped and networked labs (of 20 and 16 workstations) have been installed at the Merkland Building."; and, at Sheffield, there is a microcomputer laboratory with space for 60 machines (currently housing 30 and expected to expand to capacity this year) all of which are networked to a departmental file server and thence to the campus network, JANET and the wider world. As in a number of other places all staff have networked machines on their desks. Recently, a visiting university librarian commented that he lacked the resources to match the kind of provision available in the Department, which was a cause of some surprise to new staff, direct from one or other of the departments.

However, while resources are currently good, the continual upgrading imposes a severe burden upon departmental funds. A number of respondents commented upon this fact; for example, Professor Elkin at Birmingham notes that, "Increasingly students are beginning to expect networking, high quality printers, Windows, DTP as a matter of course. Students want to use commercial packages, not simply demonstration models. They want to see a wide range of electronic systems in operation within the Schools. Increasingly, the LIS Schools may not be funded sufficiently to keep abreast of new developments." The level of resourcing required is higher than that needed in libraries and information services, precisely because students expect to learn with the leading edge systems - rightly so, because their need is to be prepared for three to five years ahead. It is worth noting that in Spain, for example, the Ministry of Education equipped the seven LIS departments with CD ROM equipment and subscriptions to services to boost their ability to provide effective preparation.

A further aspect of resourcing concerns the human resources. RGU Aberdeen notes a common problem: "Where possible, the expertise of the University's Computer Services Unit and the Micro Electronics Development Centre have been utilized as this minimizes costs, but the School's need to be at the leading edge of developments in relevant applications of IT often places it ahead of the ability of these agencies to respond. Staff are thus largely dependent on

self-instruction, using suppliers' manuals." Staff development funds are used to support self-learning, but such resources are themselves limited in most places.

From the point-of-view of academic and research libraries there is another human resource issue - the schools and departments of LIS have many more applications for their postgraduate courses than there are studentships to provide places. If there is to be an increase in the demand for properly qualified postgraduate staff, this is an issue that ought to be addressed at the highest level.

Computer-assisted learning

One of the strategies being used to overcome some of the human resources shortfall is the development of computer-aided self-instructional materials. The departments have a CTI centre under the auspices of the UFC's Computers in Teaching Initiative, located at LUT and CTILIS is currently involved in the development of CAL packages for teaching the use of databases with support from the Flexible Learning Initiative. RGU Aberdeen notes that, "...the School is moving toward s the production of self-teaching materials and has currently completed a series of modules for teaching basic computing, DOS (MS-DOS Ver. 5), and word-processing (WORDSTAR Ver. 6)." and that "We plan to develop further hypermedia-based teaching materials, initially in AACR2 and the cataloguing area." At Sheffield development of CAL materials has been undertaken in a variety of areas, including basic computing, multi-media applications, and expert systems, and one member of staff currently has University Teaching Fund resources to explore multimedia as a CAL tool, not only within the Department, but within the University.

Conclusion

This brief review can do no more than touch upon a very complex area of teaching and learning. The review suggests that:

- a) highly motivated teachers in the departments are developing a sound basis for teaching in the area of IT applications;
- b) hardware and software resources are adequate for present needs;
- c) students are given access to public and commercial information resources through academic and other networks;
- d) computer-assisted learning packages are being developed to enable departments to cope with increasing student numbers, but additional resources will be needed to ensure that this strategy develops effectively;
- e) there is scope for an increase in the number of postgraduate studentships;
- f) the maintenance of expensive hardware and software resources may present problems in the future;
- g) staff development resources may need to be increased to cope with the constant need for knowledge of new systems and software packages.

(16 June 1993)

LA/JCC Statement on Electrocopying

LA/JCC Working Party on Copyright

This statement has been prepared by the LA/JCC (Library Association/Joint Consultative Committee) Working Party on Copyright which represents the members of the following organisations on copyright matters: ASLIB, COPOL, the Institute of Information Scientists, The Library Association, SCONUL and the Society of Archivists.

1. The LA/JCC believes in the free flow of information both for creating wealth and for education and that impeding this flow of information will in turn impede research and hinder creativity
2. The LA/JCC supports the programme set up by the EC for improving European-wide access to information. The LA/JCC agrees with the principles behind this programme, especially the removal of legal and administrative barriers.
3. The LA/JCC agrees that electronic storage of copyright material is an exclusive right of the copyright owner.
4. The LA/JCC agrees that manipulation of works in electronic format is a restricted act and that permission should be sought and given before any such manipulation takes place. The LA/JCC appreciates that on some occasions no such permission will be forthcoming.
5. The LA/JCC believes that downloading information from an online database, reformatting it to put into a database for personal use does not constitute making an adaptation of the material. Reading material in electronic form is no different from reading it in any other form.
6. The LA/JCC agrees that rising subscription prices and cuts in library budgets have resulted in a fall in revenue for journal publishers, but that the demand by users for such material has not lessened.
7. The LA/JCC agrees that there is a growing demand for publications in electronic form, especially among the academic sector, and that the technology exists for such a demand to be fulfilled quickly.

8. The role of the information professional is to act as an intermediary between the supply and demand of information to their clientele. Information professionals and their users need access to copyright protected material in electronic form.
9. There is a growing demand for the full text of journal articles from online databases and for information contained on CD-ROMs. This activity is controlled, somewhat haphazardly, by contracts. There is also a demand by information professionals and the general public to use digital scanners and document image processors, which are useful for storing vast amounts of information and so, for example, providing an answer to library storage problems and the problem of theft of library materials. Information professionals are aware that it is illegal to scan copyright protected material whereas the general public do not. The LA/JCC believes that information professionals have a role to play in educating the public about copyright.
10. The LA/JCC recognises that trends in information dissemination suggest that in future information may bypass the publishing stage. Information circulating in electronic form will only be printed when needed by the user.
11. The LA/JCC recognises that the concerns of academic authors are for recognition of their intellectual output and for easy access to each others' works whereas the publishers' concern is with receiving a fair return for their financial investment.
12. The LA/JCC recognises that the movement of information in electronic form is difficult to detect and to control and therefore copyright-protected material could be subject to unfair use and abuse.
13. The LA/JCC recognises that publishers of information need to control the electronic uses of their material, especially with the rise of the global communications network.
14. The LA/JCC believes that control of the networking of electronic information should be a recognised standard procedure. Controls should appear simple to the users of information and costs for access should not be prohibitive, and should be easy to administer and collect.
15. It is essential for information professionals to be involved in the bibliographic control of information for the purposes of indexing and retrieval. The LA/JCC believes, also, that information professionals are in the most suitable position to be able to control the monitoring process.
16. The LA/JCC believes that it is in the interests of both copyright owners and information professionals to work together towards an appropriate balance to control electrocopying.

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